

Operating and Service Instructions

MICROPROCESSOR-CONTROLLED

FLOAT BATTERY CHARGER

SINGLE PHASE INPUT

GROUP I

(6 - 25 Adc)





JA5011-01

Eagle Eye Power Solutions 4230 N Oakland Ave #176, Milwaukee, WI 53211 Phone: 877-805-3377 | Web: www.eepowersolutions.com

HOW TO READ THE AT10.1 MODEL NUMBER

GROUP I RATINGS (6-25 Adc)

The **AT10.1** configured model number is coded to describe the unit's features and options. Please identify the model number printed on the data nameplate decal, and write it in the spaces provided below.

AT10											X	X
Α	В	С	D	E	F	K	L	M	N	Р	Q	R

Follow the chart below to determine the configuration of the AT10.1.

	DESCRIPTION	CODE	FEATURE
Α	SERIES	AT10	AT10.1 BATTERY CHGR
		012	12 Vdc
В	NOMINAL DC OUTPUT	024	24 Vdc
	VOLTAGE	048	48 Vdc
		130	130 Vdc
		006	6 Adc
	NOMINAL	012	12 Adc
С	DC OUTPUT CURRENT	016	16 Adc
		020	20 Adc
		025	25 Adc
	DC FILTERING	U	UNFILTERED
D		F	FILTERED (STANDARD)
		Е	BATT ELIMINATOR FILTER
		120	120 Vac 60 Hz ¹
		208	208 Vac 60 Hz ¹
	AC INPUT	240	240 Vac 60 Hz ¹
Е	VOLTAGE	480	480 Vac 60 Hz
		220	220 Vac 50/60 Hz ²
		380	380 Vac 50/60 Hz ²
		416	416 Vac 50/60 Hz ²
	DESCRIPTION	CODE	FEATURE

i ine	the A110.1.							
	DESCRIPTION	CODE	FEATURE					
	CIRCUIT	S	STANDARD					
F	BREAKER RATING	М	MEDIUM AIC					
	(SEE TABLE)	Н	HIGH AIC					
к	, AUX ALARM	AUX	SUPPLIED					
	RELAY BOARD	XXX	NOT SUPPLIED					
L	COPPER	G	SUPPLIED					
	GROUND BUS	Х	NOT SUPPLIED					
l M	LIGHTNING	L	SUPPLIED					
	ARRESTOR	Х	NOT SUPPLIED					
_								
N	FUNGUS	F	APPLIED					
	PROOFING	Х	NOT APPLIED					
P	STATIC	S	APPLIED					
	PROOFING	Х	NOT APPLIED					
Q		Х						
R		Х						
	DESCRIPTION	CODE	FEATURE					

^{1 - 120/208/240} Vac multi-tap input - AT10.1 is wired and shipped from factory at specified voltage.

INPUT AND OUTPUT CIRCUIT BREAKER INTERRUPTING RATINGS

CODE	TYPE	AC RATINGS (ALL INPUT VOLTAGES)	DC RATINGS (125 Vdc)
S	STANDARD	240 Vac: 10,000 AIC 480 Vac: 5,000 AIC	10,000 AIC ⁴ 5,000 AIC ⁵
М	MEDIUM AIC	240 Vac: 25,000 AIC 480 Vac: 18,000 AIC	10,000 AIC
Н	HIGH AIC	240 Vac: 65,000 AIC 480 Vac: 25,000 AIC	20,000 AIC

^{4 -} Rating applies to 130Vdc 16-25 Adc units. 5 - Approximate rating applies to all other units.

NOTICE

The factory-configured model number printed on the AT10.1 data nameplate decal does not feature certain options and accessories. Nor does it feature any field-installed options. Check off below any options and/or accessories that are initially included, or are installed after shipment.

floor/rack-mounting brackets NEMA-2 type drip shield assembly NEMA-4 (12/13) type enclosure cabinet heater assembly pad lock for front panel door zero-center ground detect meter	analog ac voltmeter (penthouse-mounted) analog ac ammeter (penthouse-mounted) barrier type auxiliary alarm terminal block(s) external temperature compensation probe DNP3 Level 2 / Modbus communications module forced load sharing signal interconnection cable
Please find the serial number on the data nameplate and record it here:	

^{2 -} Special order, consult factory for availability

PLEASE READ AND FOLLOW ALL SAFETY INSTRUCTIONS

NOTICE

- 1. Before using the AT10.1, read all instructions and cautionary markings on: A) this equipment, B) battery, and C) any other equipment to be used in conjunction with the AT10.1.
- 2. This manual contains important safety and operating instructions, and should therefore be filed for easy access.
- 3. Remove all jewelry, watches, rings, etc. before proceeding with installation or service
- 4. Maintain at least 6in / 152mm of free air on all vented surfaces for cooling. Allow sufficient clearance to open the front panel for servicing.
- 5. Connect or disconnect the battery only when the AT10.1 is off, to prevent arcing or burning.
- 6. Do not operate the AT10.1 if it has been damaged in any way. Refer to qualified service personnel.
- 7. Do not disassemble the AT10.1. Only qualified service personnel should attempt repairs. Incorrect reassembly may result in explosion, electrical shock, or fire.
- 8. Do not install the AT10.1 outdoors, or in wet or damp locations, unless specifically ordered for that environment.
- 9. Do not use the AT10.1 for any purpose **not** described in this manual.

MARNING

- 1. Do not touch any uninsulated parts of the AT10.1, especially the input and output connections, as there is the possibility of electrical shock.
- 2. During normal operation, batteries may produce explosive gas. Never smoke, use an open flame, or create arcs in the vicinity of the AT10.1 or the battery.
- 3. Turn the AT10.1 **off** before connecting or disconnecting the battery to avoid a shock hazard and/or equipment damage.
- 4. De-energize and lock out all ac and dc power sources to the AT10.1 before servicing.
- 5. Do not operate the AT10.1 with any power source that does not match the specified ac and dc voltage ratings. Refer to the data nameplate decal affixed to the outside panel for operational requirements.
- 6. Do not operate the AT10.1 with the Plexiglas safety shield or any other supplied guards removed or improperly installed.

i

TABLE OF CONTENTS

		RATIONIAD THE AT10.1 MODEL NUMBER	
IM	PORTANT	SAFETY INSTRUCTIONS	i
1	Receivin	g and Installing the AT10.1 Battery Charger	
•	1.1	Storing the AT10.1	2
	1.2	Reporting shipping damage	
	1.3	Unpacking and inspecting the AT10.1	
	1.5	Inspection checklist	
	1.4	Moving the AT10.1	
	17	Enclosure type and weight table	
	1.5	Mounting the AT10.1	
		I.5.1 Wall-Mounting the AT10.1	
		I.5.2 Floor-Mounting the AT10.1	
		I.5.3 Rack-Mounting the AT10.1	
	1.6	Changing transformer taps	
	1.7	Making the ac input connections	
	1.8	Making the dc output connections	
	1.9	Wiring the AT10.1 for remote sensing	
	1.10	Wiring to the remote alarm contacts	
		Auxiliary Alarm Relay PC Board (optional)	
	1.11	Installing the temperature compensation assembly (optional)	
		Using temperature compensation	
	1.12	Installing the AT10.1 for remote communications (optional)	
		Installing the AT10.1 for forced load sharing (optional)	
2	Operatir	ng the AT10.1 Battery Charger	
	2.1	Starting the AT10.1	
	2	2.1.1 Understanding the start-up sequence	24
	2	2.1.2 Checking the installation	24
	2	2.1.3 Starting the AT10.1	24
		Using the digital meter	24
		Factory settings table	25
	2.2	Using the AT10.1 front panel features	
	2	2.2.1 If the meter displays an error message	26
	2	2.2.2 Selecting the meter mode	26
	2	2.2.3 Selecting the Float or Equalize mode	27
	2	2.2.4 Choosing the Equalize method	27
		Manual Timer method	27
		Manual Equalize method	28
		Auto-Equalize Timer method	28
	2	2.2.5 Testing the front panel indicators & Summary Alarm Relay	s29
	2	2.2.6 Testing the Auxiliary Alarm Relay PC Board	29
	2	2.2.7 Interpreting the alarm indicators	29

TABLE OF CONTENTS

	2.3	Setting the AT10.1 parameters	
		2.3.1 Understanding parameter settings	30
		2.3.2 Setting the Float and Equalize voltages	31
		2.3.3 Setting the Equalize timer	32
		2.3.4 Setting the Alarms	32
		Setting the high and low dc voltage alarms	33
		Adjusting ground detection sensitivity	34
		Disabling the ground detection alarm	35
		2.3.5 Setting the Current Limit value	35
		2.3.6 Enabling the high dc voltage shutdown feature	36
		2.3.7 Adjusting the Voltmeter accuracy	37
		2.3.8 Using the Low Level Detector (LLD)	38
		2.3.9 Using the front panel security feature	39
	2.4	Performing routine maintenance	40
		Sample preventive maintenance procedure	42
3	Servicir	ng the AT10.1 Battery Charger	
	3.1	A step-by-step troubleshooting procedure	44
	3.2	Interpreting front panel error messages	
	3.3	Using the troubleshooting chart	
	3.4	Troubleshooting chart begins on	
	3.5	Replacing defective components	58
	3.6	Ordering replacement parts	64
		Replacement parts tables (begin on)	64
APP	ENDIX	A: AT10.1 Performance Specifications	70
		B: Field Installable Accessories	
APP	ENDIX (C: Standard Drawings *	
	Outl	ine: AT10.1 Group I Battery Charger NEMA-1 Style-586 Enclosure	72
		ine: AT10.1 Group I Battery Charger NEMA-1 Style-594 Enclosure	
	Inte	rnal Component Layout: AT10.1 Style-586/594 Enclosure w/Common Options	76
	Insti	rument Panel / PC Board Detail: AT10.1 Group I Battery Charger	78
	Sch	ematic: AT10.1 Group I Battery Charger - Standard w/o Options	80
	Sch	ematic: AT10.1 Group I Battery Charger - with Common Options	82
	Con	nection Diagram: AT10.1 Group I Battery Charger - Standard w/o Options	84
	Con	nection Diagram: AT10.1 Group I Battery Charger - with Common Options	86
APP	PENDIX	D: Recommended Float/Equalize Voltages / Temp. Compensation	88
APP	PENDIX	E: Communications Module	89
APP	PENDIX	F: Forced Load Sharing	90
		G: CE Grounding Compliance & UL Data	
MAN	NUAL S	PECIFICATIONS (document control information / online availability)	94
inter If the	rnal com _l e standar	ed record drawing package is available for your particular AT10.1, featuring an item conent layout, electrical schematic with component ratings, and a full connection dia and drawings featured in this manual are not sufficient, please contact your Sales we for drawing availability from theAT10.1 manufacturer.	

1. RECEIVING THE AT10.1

1.1. STORING THE AT10.1

If you store the AT10.1 for more than a few days before installation, you should store it in its original shipping container, and in a temperature controlled, dry climate. Ambient temperatures of 32 to 122° F / 0 to 50° C are acceptable. Storage should not exceed two (2) years due to the limited shelf life of the dc filter capacitors when they are not in service.

1.2. REPORTING SHIPPING DAMAGE

Upon delivery of the AT10.1 (or related products) if you discover any damage or shortage, make notation on all copies of delivering carrier's delivery receipt before signing and notify the delivery person of your findings. If loss or damage is discovered after delivery, notify delivering carrier immediately and request an inspection. The manufacturer does not assume any liability for damage during transportation or handling.

Should the products require an inspection by (or return to) the manufacturer, please contact your sales representative for further instructions. Any returned material must be properly packed in compliance with shipping regulations. It is preferable to use the original shipping materials if possible. Mark the outside of the shipping container with the Return Material Authorization (RMA) number issued by the manufacturer.

1.3. UNPACKING AND INSPECTING THE AT10.1

Carefully remove all shipping materials from the AT10.1. Remove the AT10.1 from the shipping pallet for inspection. Save all shipping materials until you are sure that there is no shipping damage.

Once the AT10.1 is unpacked, inspect the unit for possible shipping damage, using the checklist below. If shipping damage has occurred, refer to Section 1.2 on this page for proper reporting.

INSPECTION CHECKLIST

Enclosure exterior and interior are not marred or dented.
There is no visible damage to exterior or interior components.
All internal components are secure.
Printed circuit boards are firmly seated on their standoffs.
All hardware is tight.
All wire terminations are secure.
The User's Manual is included.
You received all items on the packing list.

1.4. MOVING THE AT10.1

Once you have established that the AT10.1 is undamaged, identify the enclosure style and weight of your unit. Refer to the table below.

AT10.1 Enclosure Style and Shipping Weight Table Group I NEMA-1 Cabinets (Style-586 / Style-594)

Output	Ampere Rating						
Voltage	6 Adc	12 Adc	16 Adc	20 Adc	25 Adc		
12 Vdc	Style-586	Style-586	Style-586	Style-586	Style-586		
	44 lbs	44 lbs	67 lbs	67 lbs	67 lbs		
	20 kg	20 kg	30 kg	30 kg	30 kg		
24 Vdc	Style-586	Style-586	Style-586	Style-586	Style-586		
	44 lbs	58 lbs	75 lbs	75 lbs	75 lbs		
	20 kg	26 kg	34 kg	34 kg	34 kg		
48 Vdc	Style-586	Style-586	Style-594	Style-594	Style-594		
	58 lbs	75 lbs	110 lbs	110 lbs	110 lbs		
	26 kg	34 kg	50 kg	50 kg	50 kg		
130 Vdc	Style-586	Style-594	Style-594	Style-594	Style-594		
	80 lbs	147 lbs	193 lbs	193 lbs	193 lbs		
	36 kg	67 kg	88 kg	88 kg	88 kg		

Actual unit weight is approximately 20 lbs / 9kg below listed shipping weight in table.

The Style-586 & Style-594 enclosures do not feature top lifting eyes for moving. Move the AT10.1 with a forklift whenever possible, using the supplied shipping pallet.

Lift the AT10.1 into a wall-mount or rack-mount installation, using a heavy-duty sling or a scissor lift.

For further AT10.1 standard cabinet information, see the outline drawings for the Style-586 (**JE5023-03**) and Style-594 (**JE5024-03**) enclosures in Appendix C on pages 72 and 74.

1.5. MOUNTING THE AT10.1

The AT10.1 must be installed in manner that allows easy access to the front ac (CB1) and dc (CB2) circuit breakers. Chose a mounting method for the AT10.1 enclosure from the table below.

MANUAL	MOUNTING METHOD	ENCLOSURE		
SECTION	WOONTING WILTHOD	Style-586	Style-594	
1.5.1	Wall-Mounting	STANDARD	STANDARD	
1.5.2	Floor-Mounting	OPTIONAL	OPTIONAL	
	19in / 483mm Rack-Mounting	OPTIONAL	N/A	
1.5.3	23-24in / 584-610mm Rack-Mounting	OPTIONAL	OPTIONAL	

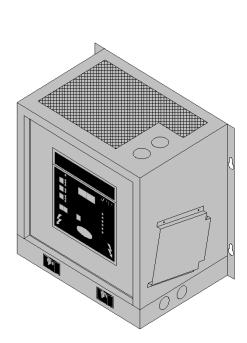
1.5.1. Wall-Mounting the AT10.1

Wall-mounting is the standard means of installing the AT10.1 Group I enclosures. When wall-mounting the AT10.1, consider the following:

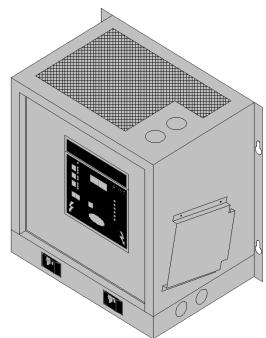
- 1. Refer to the outline drawings for the Style-586 (<u>JE5023-03</u>) and Style-594 (<u>JE5024-03</u>) enclosures in Appendix C on pages 72 and 74.
- 2. The wall must be strong enough to properly support the weight of the AT10.1, plus a safety factor. See the Weight Table featured in Section 1.4 on page 3. The weight of your AT10.1 may be different, depending on the feature, options, and accessories ordered with the unit.
- 3. Be conscious of planned ac input and dc output wiring to the AT10.1, selecting conduit entrances carefully. Use of the pref-fab knockouts on the sides or bottom of the enclosure will allow removal of the cabinet shroud (and internal access for servicing) without removal of the unit from the wall.

4. The location:

- Should be free of drips and splatter. If falling particles and liquids are a problem, install a NEMA-2 type drip shield accessory (**El0191-00**). For kit availability, see ordering information in Appendix B on page 71.
- Should be between 32° and 122° F / 0 and 50° C, with relative humidity between 5% and 95% non-condensing.
- Must be free of flammable or explosive materials.
- 5. Maintain at least 6in / 152mm of free air on all vented surfaces for cooling.
- 6. Allow at least 36in / 914mm front clearance for access to the AT10.1 for operation and maintenance.



Style-586 Enclosure

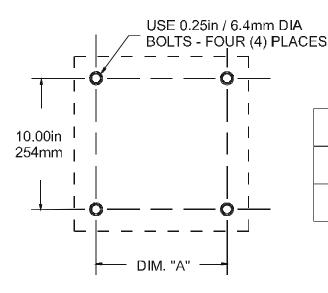


Style-594 Enclosure

PROCEDURE

Install four (4) 0.25in / 6.4mm anchor bolts (not supplied) rated to support the weight of the AT10.1, plus a safety factor of at least two (2) times, into the wall. Place the AT10.1 onto the anchor bolts, add appropriate mounting hardware, and tighten securely. Refer to the graphics below for AT10.1 Style-586 & Style-594 wall-mounting patterns and specifications.

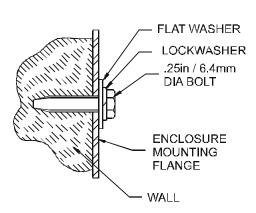
GRAPHICS - WALL-MOUNTING THE AT10.1



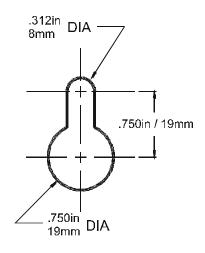
AT10.1 MOUNTING DIMENSION

ENCLOSURE	DIM. "A"
Style-586	15.00in / 381mm
Style-594	18.25in / 464mm

MOUNTING BOLT PATTERN



RECOMMENDED MOUNTING HARDWARE LOADING



KEYHOLE SLOT USED ON AT10.1 MOUNTING FLANGE

1.5.2. Floor-Mounting the AT10.1

To install the AT10.1 onto a horizontal surface, the standard Style-586 and Style-594 enclosures do not need to be modified, but a special floor-mounting accessory (**El0192-00**) is required. For kit availability, see ordering information in Appendix B on page 71. The kit includes a set of mounting brackets that elevate the top of the AT10.1 approximately 47in / 1194mm above floor level, with provisions for floor anchoring. The kit also includes appropriate hardware and *Installation Instructions* (JA0083-00) for the floor-mounting procedure.

When floor-mounting the AT10.1, consider the following:

- 1. Locate anchor bolt holes at least 4.25in / 108mm from any wall, to allow clearance behind the mounting brackets.
- 2. Be conscious of planned ac input and dc output wiring to the AT10.1, selecting conduit entrances carefully. Use of the pref-fab knockouts on the sides or bottom of the enclosure will allow removal of the cabinet shroud (and internal access for servicing) without removal of the unit from the wall.
- 3. The location:
 - Should be free of drips and splatter. If falling particles and liquids are a problem, install a NEMA-2 type drip shield accessory (**El0191-00**). For kit availability, see ordering information in Appendix B on page 71.
 - Should be between 32° and 122° F / 0 and 50° C, with relative humidity between 5% and 95% non-condensing.
 - Must be free of flammable or explosive materials.
- 4. Maintain at least 6in / 152mm of free air on all vented surfaces for cooling.
- 5. Allow 36in / 914mm front clearance for operation and maintenance.

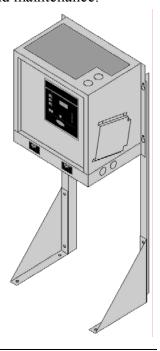
PROCEDURE

Install four (4) 0.25in / 6.4mm anchor bolts (not supplied) rated to support the unit weight plus a safety factor of at least two (2) times, into the floor.

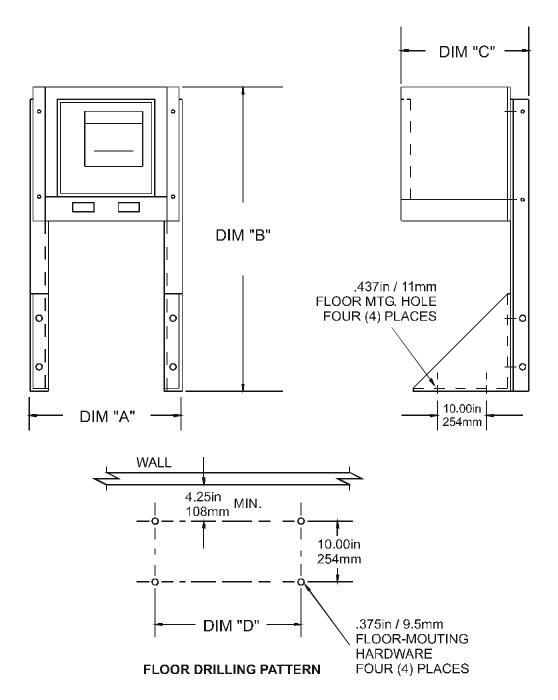
Assemble the floor-mounting accessory to the anchor bolts as shown. Place the AT10.1 onto the vertical posts, add appropriate mounting hardware, and tighten.

Refer to the graphics on the opposite page for the AT10.1 Style-586 & Style-594 floormounting patterns and enclosure footprints.

See *Installation Instructions* (<u>JA0083-00</u>) for the special floor-mounting procedure.



GRAPHICS - FLOOR-MOUNTING THE AT10.1



	DIMENSION (in / mm)						
ENCLOSURE	Α	В	С	D			
Style-586	16.50 / 419	46.63 / 1184	11.75 / 298	15.00 / 381			
Style-594	19.75 / 502	47.75 / 1213	14.25 / 361	18.25 / 463			

1.5.3. Rack-Mounting the AT10.1

The AT10.1 can be installed into most relay racks with standard EIA hole spacing. The Style-586 and Style-594 enclosures do not need to be modified for rack mounting, but a special kit (**EI0193-00**) is required.

For kit availability see the ordering information in Appendix B on page 71. The kit includes two (2) mounting brackets, appropriate hardware, and *Installation Instructions* (<u>JA0091-00</u>) for the rack-mounting procedure. Refer to the table below for allowable combinations.

CHARGER RATING		RACK WIDTH		
Vdc	Adc	19in / 483mm	23in / 584mm	24in / 610mm
12 Vdc	all	Yes	Yes	Yes
24 Vdc	all	Yes	Yes	Yes
48 Vdc	6-12 Adc	Yes	Yes	Yes
48 Vdc	16-25 Adc	No	Yes	Yes
130 Vdc	6 Adc	Yes	Yes	Yes
130 Vdc	12-25 Adc	No	Yes	Yes

When rack-mounting the AT10.1, consider the following:

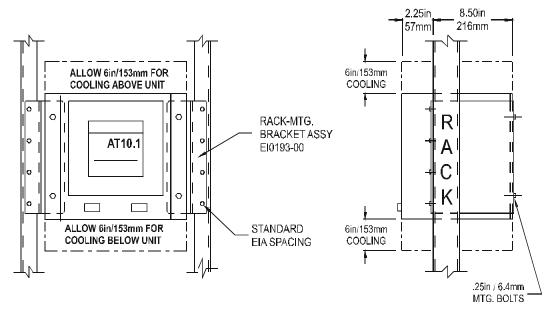
- 1. The rack must be strong enough to properly support the weight of the AT10.1. See the Weight Table located in Section 1.4 on page 3.
- 2. Be conscious of planned ac input and dc output wiring to the AT10.1, selecting conduit entrances carefully. Note the standard pre-fab conduit knockouts located on the sides, top, and bottom of the enclosures. Ensure that planned conduit is accessible after the AT10.1 is rack-mounted.
- 3. The location:
 - Should be free of drips and splatter. If falling particles and liquids are a problem, install a NEMA-2 type drip shield accessory (**El0191-00**). For kit availability, see ordering information in Appendix B on page 71.
 - Should be between 32° and 122° F / 0 and 50° C, with relative humidity between 5% and 95% non-condensing.
 - Must be free of flammable or explosive materials.
- 4. Maintain at least 6in / 152mm of free air on all vented surfaces for cooling.
- 5. Allow at least 36in / 914mm front clearance for access to the AT10.1 for operation and maintenance.

PROCEDURE

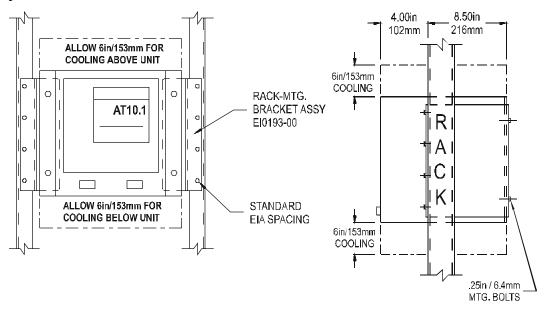
To rack mount the AT10.1, first install the mounting brackets into the rack using proper hardware (not supplied). Second, mount the AT10.1 onto the installed brackets, using the supplied kit hardware. Provide at least 6in / 152mm of free air above and below the AT10.1 for cooling. Refer to the graphics on the opposite page for the rack-mounting configurations.

GRAPHICS - RACK-MOUNTING THE AT10.1

Style-586 Enclosure



Style-594 Enclosure



NOTES

- 1. Mounting brackets and AT10.1 enclosures are installed from the front.
- 2. Above installations are shown without optional penthouse enclosure. If penthouse is supplied, add 7in / 178mm to top of enclosure.
- 3. Refer to the outline drawings for the Style-586 (<u>JE5023-03</u>) and Style-594 (<u>JE5024-03</u>) enclosures in Appendix C on pages 72 and 74.

1.6. CHANGING TRANSFORMER TAPS

MARNING

The AT10.1 power isolation transformer (T1) is wired at the factory, for the ac input supply voltage specified and listed on the **CAUTION** tag attached to the ac input circuit breaker (CB1). Units with a multi-tap ac input feature (e.g. 120/208/240 Vac) will list all available ratings on the data nameplate decal. AT10.1 transformers are designed with an input voltage tolerance of +10% to -12%.

Before you connect ac power to the AT10.1, inspect the wiring of the transformer inside the enclosure, and confirm it is "jumpered" for the desired ac input supply voltage. If a different ac input supply is desired, identify the AT10.1 ac input feature, and whether or not the transformer (T1) is re-tappable.

- 120/208/240 Vac 60Hz (re-tappable)
- 480 Vac 60Hz (*non*-tappable)
- 120/220/240 Vac 50/60Hz (re-tappable)
- 380/416 Vac 50/60Hz (re-tappable)

Before changing the T1 taps, turn off and lock ac and dc supplies to the AT10.1. Merely turning off (opening) the unit's ac and dc circuit breakers (CB1/CB2) does *not* eliminate live voltages inside the enclosure. Also, de-energize any external wiring to the AT10.1 alarm relay contacts (TB3/TB4). Verify that all voltages within the AT10.1 are de-energized and locked out before proceeding.

Except those with the 480Vac feature, AT10.1 Group I power isolation transformers have two (2) jumpers. The transformers used in the smaller (Style-586) enclosure use piggyback quick-connect terminals. Those used in the larger (Style-594) enclosure use 10-32 stud terminals.

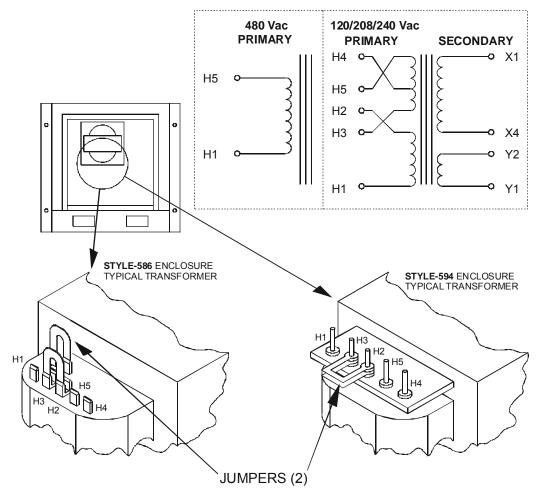
NOTICE

This procedure refers **only** to Group I AT10.1 battery chargers (**rated 6-25 Adc**). A different procedure exists for Group II AT10.1 battery chargers (**rated 30-100 Adc**). Refer to the Operating and Service Instructions specific to the Group II AT10.1 battery charger for changing the transformer taps on these larger units. Otherwise, damage to your AT10.1 and equipment may occur.

PROCEDURE

- 1. See Section 3.5 for necessary steps to follow when accessing internal components within the AT10.1.
- 2. Shut down the AT10.1 and verify that no internal voltages are present.

3. Refer to the images below and identify the primary "taps" (T1-H#) on the AT10.1 Group I power isolation transformer (T1).



- 4. 480Vac transformers only feature T1-H1 & T1-H5, and are not re-tappable.
- 5. Inspect the transformer inside the AT10.1 and identify the five (5) primary "taps" (T1-H1, -H3, -H2, -H5 & T1-H4 arranged left-to-right).
- 6. Locate the two (2) jumpers on the primary-side "taps".
- 7. As needed, change the jumpers on the transformer taps as listed in the table below, making sure to always use *both* jumpers.

120 Vac	208 Vac	240 Vac	480 Vac
H1 to H3, H2 to H5	H2 to H4, (2) jumpers	H2 to H3, (2) jumpers	none

- 8. Check your work and make sure all connections are tight.
- 9. Restart the AT10.1 using the startup procedure in Section 2.1.
- 10. For more information, see the schematics & wiring diagrams in Appendix C.
- 11. Confirm that the ac feeder breaker upstream from the AT10.1 is sized properly for the new ac input voltage.
- 12. For maximum ac input current values, refer to standard (DC5016-00).

1.7. MAKING THE AC INPUT CONNECTIONS

MARNING

The AT10.1 is a commercial product, and not intended for use at any time in a residential environment, or to be powered by low-voltage public mains.

It is the responsibility of the *installer* of the AT10.1 to provide suitable ac supply wiring. Wiring must be approved for use in the country in which the AT10.1 is installed, or bear the ◀ HAR ▶ mark. When selecting wire sizes, consult the data nameplate decal affixed to the side panel of the AT10.1 for voltage and current requirements. For CE compliance, see Appendix G on page 92 for proper grounding.

Follow these steps to supply proper ac power to the AT10.1:

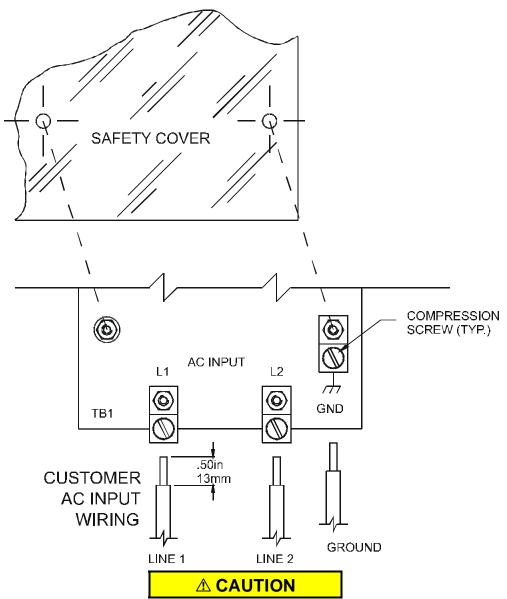
- 1. Confirm that the AT10.1 main power transformer (T1) is properly jumpered for your ac input supply voltage. See Section 1.6 for details.
- 2. Use a branch circuit breaker or fused disconnect switch upstream from the AT10.1. This device should have lockout capability so that the ac input supply to the AT10.1 can be de-energized for unit maintenance. A time delay circuit breaker or slow-blow fuse is recommended.
- 3. Size the branch circuit breaker or fused disconnect switch for the maximum ac input current of the AT10.1. This rating is listed on the left-hand side of the AT10.1 data nameplate. For a comprehensive list of these maximum ac input values, access standard (DC5016-00).
- 4. Size ac input wiring per the National Electric Code (NEC) and local codes for the trip rating of the branch circuit breaker or fused disconnect switch.
- 5. Do not run external ac input power wiring through the same conduit of the AT10.1 enclosure as external dc output power wiring.
- 6. All site requirements of your facility take precedence over these instructions.

PROCEDURE

- 1. Remove the Plexiglas safety shield.
- 2. Run the ac input supply wiring into the AT10.1, ending at terminals TB1-L1, TB1-L2, and TB1-GND on the I/O panel board.
- 3. The AT10.1 features three (3) CU-AL compression lugs on the ac input terminals, which accept #14 6 AWG wire. Strip 0.50in / 13mm from the insulation of the incoming ac input supply wiring.
- 4. Connect the wires to the appropriate ac lugs as shown on the next page.
- 5. Using a flat-head screwdriver, securely tighten the compression screws on the ac lugs to 35-45 in-lb / 4.0-5.1 Nm.
- 6. Check all connections and reinstall the Plexiglas safety shield.

MAKING THE AC INPUT CONNECTIONS - GRAPHICS

REPLACE SAFETY COVER
AFTER CONNECTIONS ARE MADE



NOTES

- 1. The drawing above does not show other components mounted to the I/O panel. Be careful not to disconect any other component leads.
- 2. Conduit must be properly grounded, and in compliance with the national wiring rules of the country where installed. See Appendix G for details.
- 3. Use copper or aluminum conductors only.
- 4. On 120 Vac input, connect the neutral leg to the terminal L2.

1.8. MAKING THE DC OUTPUT CONNECTIONS

It is the responsibility of the *installer* of the AT10.1 to provide suitable dc output, battery, and dc load wiring. Follow these steps to connect the battery to the AT10.1:

1. Size the dc wiring to minimize voltage drop. The acceptable wire size depends on your installation. As a guideline, the voltage drop should not exceed 1% of nominal output voltage at full current. Refer to the table below to determine the voltage drops for various wire sizes, currents and distances.

WIRE SIZING CHART VOLTAGE DROP PER 100ft / 30.5m OF WIRE (FOR COPPER AT 68° F / 20° C)

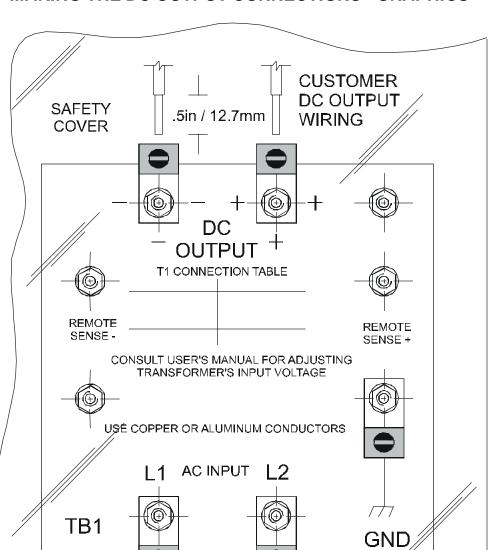
WIRE SIZE	DC CURRENT (Amperes)				
(AWG)	6	12	16	20	25
#16	2.5V	5.0V	6.7V	8.2V	10.5V
#14	1.6V	3.2V	4.2V	5.3V	6.6V
#12	1.0V	2.0V	2.6V	3.3V	4.2V
#10	0.63V	1.3V	1.7V	2.1V	2.6V
#8	0.40V	0.80V	1.1V	1.3V	1.7V
#6	0.25V	0.50V	0.66V	0.83V	1.1V
#4	0.16V	0.32V	0.42V	0.52V	0.65V

EXAMPLE: 100ft / 30.5m of #8 AWG wire at 16A has a 1.1V drop.

- 2. The AT10.1 is factory wired to regulate output voltage at the output terminals. If the total voltage drop is greater than 1% (e.g., 1.3V for a 130 Vdc system), remote sense wiring is recommended, see Section 1.9.
- 3. Do not run external ac and dc power wiring, feeding the AT10.1, through the same conduit.
- 4. All specific requirements of your facility take precedence over these instructions.

PROCEDURE

- 1. Use a dc disconnect switch or circuit breaker between the AT10.1 and dc bus. This device should have lockout capability to allow the AT10.1 to be disconnected from the dc bus for maintenance.
- 2. Remove the Plexiglas safety shield.
- 3. Run the dc wiring to terminals TB1(+) and TB1(-) on the I/O panel board in the enclosure. Compression lugs, accepting wire sizes #14-6 AWG, are supplied for your convenience.
- 4. Strip the insulation 0.50in / 12.7mm on the incoming wires. Connect the wires to the appropriate dc lugs as shown on the next page.
- 5. Using a flat-head screwdriver, securely tighten the compression screws on the lugs to 35-45 in-lb / 4.0-5.1 Nm.
- 6. Reinstall the safety shield after you have made and checked all connections.



MAKING THE DC OUTPUT CONNECTIONS - GRAPHICS

⚠ CAUTION

NOTES

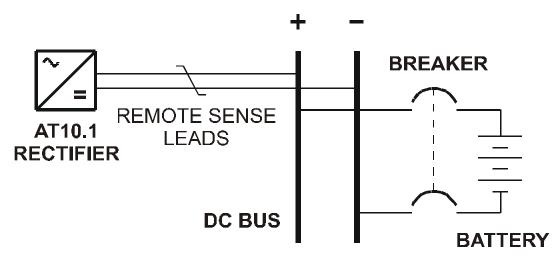
- 1. The drawing above does not show other components mounted to the I/O panel. Be careful not to disconect any other component leads.
- 2. Always use a proper ground.
- 3. Use copper or aluminum conductors only.

1.9. WIRING THE AT10.1 FOR REMOTE SENSING

You can wire the AT10.1 to regulate the output voltage at the battery terminals, instead of at the charger output terminals (TB1+/-). Remote sensing provides the following:

- 1. Compensates for voltage drop in the dc wiring between the AT10.1 and the battery.
- 2. Directly monitors the battery or dc bus voltage. The front panel meter displays the actual voltage on the battery or dc bus.

SCHEMATIC



You wire the AT10.1 for remote sensing by installing twisted pair cabling from the AT10.1 remote sense terminals to the battery terminals. The AT10.1 control circuitry then measures the dc voltage at the battery terminals, and controls the output of the charger to maintain the battery voltage at the desired float or equalize voltage.

NOTICE

If the remote sense wiring fails, the AT10.1 detects the fault, and displays **E 06** on the front panel meter. See Section 3.2 for details.

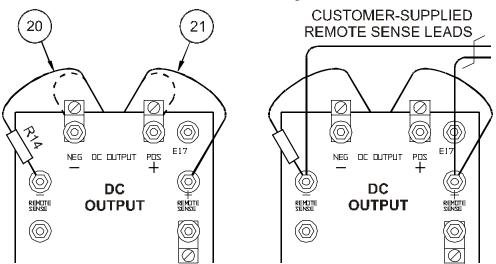
⚠ CAUTION

The AT10.1 cannot protect against short circuits in the remote sense wiring. You should install a 1.0A fuse at the battery or dc bus end of the remote sense cable.

PROCEDURE

- 1. De-energize and lock out all ac and dc voltages within the AT10.1 enclosure. Check with a voltmeter.
- 2. Remove safety shield.
- 3. Remove the two (2) dc output CU-AL compression lugs.

- 4. Move lugged end of R14 (with wire # 20) from TB1(-) to REM SENSE(-).
- 5. Move wire # **21** from TB1(+) to REM SENSE (+).
- 6. Connect user-supplied external remote sense leads from the battery or dc bus to the remote sense terminals on the I/O panel.



- 7. Replace the two (2) dc output CU-AL compression lugs and tighten all hardware.
- 8. Check your work thoroughly. Replace the safety shield before re-energizing the AT10.1.
- 9. Restart the AT10.1 according to the instructions in Section 2.1.

NOTES

- 1. Use #16 AWG twisted pair wire.
- 2. Maximum current is 150 mA.
- 3. Run leads in their own conduit.
- 4. Fuse the wiring at the battery or dc bus.

DISABLING REMOTE SENSE

If you ever need to disable remote sense, follow the steps below:

- 1. De-energize and lock out all ac and dc voltages to the AT10.1.
- 2. Check with a voltmeter.
- 3. Disconnect the remote sense wires from the battery or dc bus *first*.
- 4. Remove the remote sense leads from the remote sense (+) and (-) terminals on the I/O panel (TB1) *second*.
- 5. Insulate each lead separately, coil up the wires, and leave them in the bottom of the AT10.1, in case you want to wire for remote sense in the future.
- 6. Reconnect the lugged end of R14 (with wire # 20) to TB1(-).
- 7. Reconnect wire # 21 to TB1(+).
- 8. Restart the AT10.1 according to the instructions in Section 2.1.

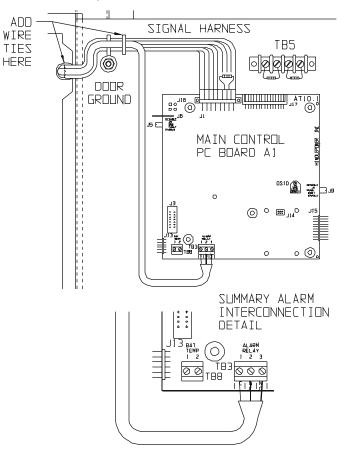
1.10. WIRING TO THE REMOTE ALARM CONTACTS

Built-in Summary "Common" Alarm Relay (standard)

The AT10.1 Main Control PC Board (A1) is equipped with a "common" Summary Alarm relay. This relay contact transfers when any one or more of the standard AT10.1 alarms exist.

See Sections 2.2.7 and 2.3.4 for a list of these alarms and status codes. One form-C alarm contacts are provided, and accessible via terminal block (TB3), as shown in the figure to the right.

Follow the procedure below to wire a remote annunciator to this contact.



PROCEDURE

- 1. Allow 30in / 762mm of wire inside the enclosure. Excess will be trimmed.
- 2. Route annunciator wires to the AT10.1 front panel door by following the existing harness through the door hinge as shown. Use two (2) wire ties and allow a 4-6in / 102-153mm loop for the hinge.
- 3. Trim wires to the proper length for connecting to TB3. Strip 0.25in / 6.4mm of insulation from the wires.
- 4. Make the connections at TB3, and securely tighten compression screws.

NOTES

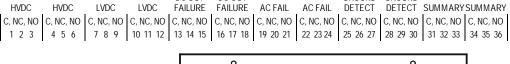
- 1. Alarm contacts are rated at 0.5A / 125 Vac or Vdc.
- 2. Summary Alarm relay terminal block (TB3) is compression type, accepting wire sizes #22-14 AWG.
- 3. Terminals are labeled in non-alarm condition.
- 4. If user alarm contacts (TB3 and/or TB4A/B) are to drive inductive **dc** loads (e.g. a larger dc relay) an external protective diode must be applied at the dc relay to avoid equipment damage. See *Application Note* (JD5011-00).

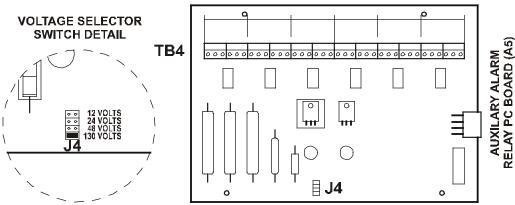
Auxiliary Alarm Relay PC Board (optional)

The optional Auxiliary Alarm Relay PC Board (A5), mounted inside the separate top enclosure (penthouse), provides two (2) form-C contacts (TB4-1 through TB4-36) for each of the following individual alarms:

- High DC Voltage
- Low DC Voltage
- DC Output Failure
- AC Input Failure
- Ground Fault Detection (positive or negative)
- Summary (common) Alarm

Alarm contacts (TB4A/B), marked in non-alarm condition, are as follows:





PROCEDURE

- 1. De-energize and lock out all ac and dc voltages to the AT10.1.
- 2. Allow internal voltages to dissipate, then check with a voltmeter.
- 3. Remove the top panel from the penthouse enclosure (on top of chassis).
- 4. Route your remote annunciator wiring into the penthouse enclosure through one of the unused knockouts on the side of the enclosure.
- 5. As shown in the figure above, connect the wiring (use #22-14 AWG) to the appropriate terminals of TB4 on the Auxiliary Alarm Relay PC Board (A5).
- 6. Strip each wire 0.25in / 6.4mm, and securely tighten the terminal screws.
- 7. Replace the top panel on the penthouse enclosure and restart the AT10.1.

NOTES

- 1. Alarm contacts are rated at 0.5A / 125 Vac or Vdc.
- 2. Terminal block (TB4) is compression type, accepting #22-14 AWG wire.
- 3. Terminals are labeled in non-alarm condition.
- 4. For a detailed view of the optional Auxiliary Alarm Relay PC Board (A5), refer to drawing (**JE5030-19**) listed in Appenix C on Page 78.

1.11. INSTALLING THE TEMPCO PROBE ASSEMBLY (OPTIONAL)

The temperature compensation (or TempCo) probe contains a temperature-dependent resistor in an epoxy module that you install near your battery. There are three steps in installing the assembly:

- 1. Mounting the probe assembly near the battery.
- 2. Installing an interconnection cable from the probe assembly to the AT10.1.
- 3. Wiring the *charger end* of the cable to a terminal block on the AT10.1.

The actual temperature compensation probe (A10), or puck, is the same for all battery types and all output voltages of the AT10.1. The accessory part numbers differ depending on cable length ordered. See the tables in Appendix B on page 71 for ordering information. Each kit contains detailed *Installation Instructions* (JA5015-00), and a separate *Application Note* (JD5003-00) for further user details. The main elements of the installation are outlined below.

MARNING

High voltages appear at several points inside the AT10.1. Use extreme caution when working inside the enclosure. Do not attempt to work inside the AT10.1 unless you are a qualified technician or electrician. Disconnect and lock out all power from the AT10.1 before starting to remove or replace any components. Turn the ac power off at the distribution panel upstream from the charger. Disconnect the battery from the AT10.1 output terminals TB1(+/-).

PROCEDURE

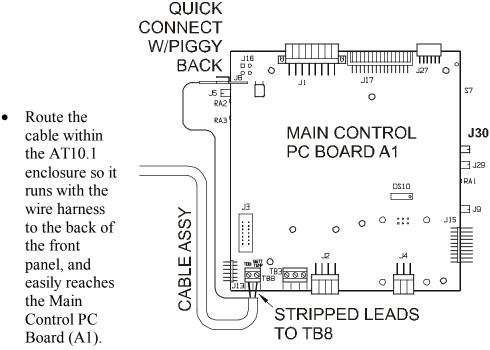
- 1. De-energize and lock out all ac and dc voltage sources to the AT10.1, and check with a voltmeter before proceeding.
- 2. Mount the probe on a clean, dry surface, as close to the battery as possible, such as the battery rack. *DO NOT* mount the probe:
 - on the battery itself
 - on unpainted wood, or bare galvanized metal
 - on plastic surfaces
- 3. To apply the probe, clean the mounting surface with isopropyl alcohol, and allow to dry thoroughly. Remove the protective backing from the double-faced adhesive tape on the probe, and securely press it onto the surface.
- 4. Install the cable supplied with the temperature compensation probe kit:
 - Start at the AT10.1. The end of the cable with two stripped wires and a quick-connect terminal will be installed inside the AT10.1.
 - Leave 30in / 762mm of cable inside the enclosure, and route the other end to the probe at the battery.

- Run the cable though a conduit if possible, but not through a conduit containing any power wiring.
- Route the other end to the probe at the battery and coil up excess cable.

NOTICE

If the standard (25ft / 7.6m) cable is not long enough, longer cable assemblies are available in lengths of 50, 100 & 200ft / 15.2, 30.5 & 61.0m. See Appendix B on page 71 for ordering information.

- Make sure wiring conforms to NEC, local, and site requirements.
- 5. Attach the interconnection cable to the AT10.1 as shown in the figure below:



- At the Main Control PC Board (A1), insert one of the bare wires from the cable into each terminal of TB8. Polarity is not vital.
- Unplug the harness ground wire # 30 from terminal J6 on the left edge of the Main Control PC Board (A1). Plug the connector at the end of the nylon-shielded wire of the cable assembly onto J6. Reconnect the ground wire # 30 from the system harness onto the piggy-back connector featured at the end of the nylon-shielded wire.
- Using plastic wire ties, fasten the interconnection cable loosely to the existing wire harness. Make sure that the cable conforms to the service loop at the hinge end of the door.
- 6. At the battery, connect the quick-connect terminals to the temperature compensation probe. Polarity is not vital. Coil up any excess wire and tape or tie it together to prevent damage.
- 7. Set jumper (J30) on the Main Control PC Board (A1) to positions 2-3 to use *compensated* voltages, or to positions 1-2 to use *uncompensated* voltages.

INSTALLING THE AT10.1

- 8. Check your work. Be sure that:
 - All connections are secure.
 - The shield is connected to ground at the *charger end only* (A1-J6).
 - The cable is connected to the 2-position terminal block (TB8) on the Main Control PC Board (A1). Other terminal blocks may look similar.
- 9. Restart the AT10.1 using the startup procedure in Section 2.1. During startup, the AT10.1 displays **Pb** on the front panel meter, indicating that the temperature compensation is set up for lead-acid battery types. While this is being displayed, you can press any front panel key to change the display to read **nicd**, to change the temperature compensation setup for nickel-cadmium batteries. The choice you make is saved internally, and will be used again by the AT10.1 the next time it starts.
- 10. Adjust the output float and equalize voltages to the battery manufacturer's recommended values, using the AT10.1 front panel meter, as described in Section 2.3.2.

NOTICE

If the temperature compensation probe, or the probe wiring, is damaged and becomes an open circuit, the AT10.1 detects the damage and displays **E 08** on the front panel meter. The AT10.1 then reverts to normal non-temperature-compensated operation until the probe or wiring is repaired. Once the probe is repaired, you must restart the AT10.1 to activate the probe, as described in Section 2.1.

Using temperature compensation

When an electric storage battery is being charged, the terminal voltage of the battery changes a small amount whenever the battery temperature changes. As the battery temperature increases, its terminal voltage decreases. When a constant output voltage float type rectifier charges a battery, float current increases when the temperature increases. This results in overcharging the battery, which can result in damage to the materials, or at least the need for more frequent maintenance.

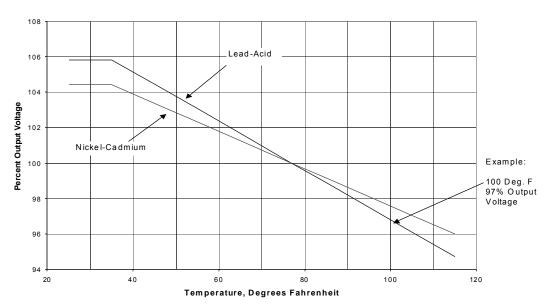
When the AT10.1 is equipped with a temperature compensation probe, it is able to adjust the output voltage applied to the battery to keep the float current constant, thereby avoiding overcharging. The probe senses the ambient temperature at the battery, and adjusts the output float/equalize voltages to compensate for variations in temperature. If the ambient temperature increases, the AT10.1 output voltage decreases.

If you are experiencing any inconsistencies in the AT10.1 when the temperature compensation probe is utilized, temporarily disconnect the probe and refer to *Application Note* (JD5003-00) for further details.

Note the following:

- You should set the Float and Equalize voltages to the values recommended by your battery manufacturer for 77° F (25° C).
- When you enter the **Edit Mode** to adjust the Float or Equalize voltage (see Section 2.3.2), the front panel meter displays the 77° F (25° C) value for the Float or Equalize voltage, even if the battery is warmer or cooler than 77° F (25° C).
- The actual output voltage of the AT10.1 may be different from the value displayed on the front panel meter, if the battery is warmer or cooler than 77° F (25° C).
- Use a digital meter to measure the actual output voltage of the AT10.1. If you know the temperature at the temperature compensation probe, you can use the graph below to determine that the output voltage is correct.
- If the battery temperature goes below 32° F (0° C), there will be no further increase in AT10.1 output voltage. Likewise, if the battery temperature goes above 122° F (50° C), there is no further decrease in output voltage.

OUTPUT VOLTAGE VS BATTERY TEMPERATURE



EXAMPLE: Suppose you have a lead-acid battery whose temperature is 100° F / 37.8° C. As shown on the graph, the output voltage should be approximately 97% of the 77° F voltage. If the float voltage is set on the front panel to 132 Vdc, the actual output voltage will be:

 $132 \times 0.97 = 128 \text{ Vdc}$

1.12. INSTALLING FOR REMOTE COMMUNICATION (OPTIONAL) Refer to separate *Operating Instructions* (JA0102-04).

1.13. INSTALLING FOR FORCED LOAD SHARING (OPTIONAL) Refer to Appendix F on page 90 or *Operating Instructions* (JA5054-00).

2. OPERATING THE AT10.1 BATTERY CHARGER

2.1. STARTING THE AT10.1

2.1.1. Understanding the startup sequence

The AT10.1 is set up at the factory to work with most common batteries and loads without further adjustment. When you start the AT10.1 for the first time, the factory settings (float voltage, equalize voltage, etc.) control the operation of the charger. You can change the settings after you start the AT10.1. The **FACTORY SETTINGS** are listed in table on page 25. The AT10.1 startup routine takes about five seconds. The microprocessor that controls the AT10.1 initializes the charger by reading the settings that are stored internally. The control circuitry then "soft starts" the AT10.1, and the dc output voltage and current increase gradually to the rated value.

2.1.2. Checking the installation

Be sure that you have followed the installation instructions carefully. Check the ac input supply voltage and the battery voltage, and be sure that they match the information on the AT10.1 nameplate. *Verify that the jumpers on the main transformer (T1) are correct for your ac supply voltage*. Open the front panel, and check the battery polarity at the TB1 (+) and (-) terminals.

2.1.3. Starting the AT10.1

When you are sure that all connections to the AT10.1 are properly made, follow these steps to start up the AT10.1:

Using the Digital Meter

When you first start the AT10.1, the meter display alternates between dc output voltage and dc output current. Each reading is held for two (2) seconds. Lights to the left display indicate of the whether the meter displaying voltage or current. If you want to "freeze" the meter to display only voltage, press the **METER MODE** key on the front panel. To freeze the meter to display only current, press the key Press the key twice again. more revert to the alternating display.

• Turn on the front panel dc circuit breaker. The digital meter indicates the battery voltage only. If the meter display does not light, *do not proceed*. Turn off the dc breaker, and check all connections and the battery polarity again. Also check the battery voltage. It must be above 50% of nominal voltage to turn on the display. If you cannot find the problem, refer to the *Troubleshooting Procedure* in Section 3.1 on page 44.

NOTICE

If you attempt to turn on the dc circuit breaker (CB2) with the battery connected in reverse polarity, the breaker will immediately trip. Do not try to close the dc breaker again, since this may damage the AT10.1. Correct the battery polarity before proceeding.

- If you have an optional temperature compensation probe installed, the front panel displays **Pb** during startup, indicating that temperature compensation is set up for lead-acid battery types. While this is being displayed, you can press any front panel key to change the display to read **nicd**, to change the temperature compensation setup for nickel-cadmium batteries. The choice you make is saved internally, and will be used again by the AT10.1 then next time it starts.
- Turn on the front panel ac circuit breaker. The digital meter displays the output voltage and current. See *Using the Digital Meter* on page 24. You should hear a soft hum from the AT10.1 as the output current increases.

NOTICE

If you have a filtered model of the AT10.1, and you turn on the ac breaker (CB1) first, before the dc breaker (CB2), there is a possibility that the dc breaker will trip when you try to turn it on. This is caused by the filter capacitors (C1) discharging into the battery. To get around this problem, turn off the ac breaker. Restart the AT10.1 by turning on the dc breaker first.

• The green **FLOAT** indicator lights. Press the **CHRG MODE** key on the front instrument panel. The **FLOAT** indicator goes off, and the yellow **EQLZ** indicator lights. Press the **CHRG MODE** key again to return the AT10.1 to the float mode.

The table below lists the normal factory settings for float and equalize voltages, equalize time, Current Limit setting, and alarm settings. If your purchase order specified other float or equalize voltage settings, a tag attached to the front panel of the AT10.1 lists the actual voltage settings.

FACTORY SETTINGS FOR ALL PARAMETERS

Parameter	Nominal Vdc			
Parameter	12	24	48	130
Float Voltage	13	26	52	131
Equalize Voltage	14	28	56	139
HVDC Alarm	14.4	28.8	57.6	144
LVDC Alarm	12	24	48	120
Equalize Time	24 Hours			
Equalize Method	Manual Timer			
Current Limit	110% of nominal output current			
HVDC Shutdown	Disabled			

2.2. USING THE AT10.1 FRONT PANEL FEATURES

2.2.1. If the meter displays an error or status message

The AT10.1 microprocessor control circuitry performs diagnostic checks of the battery charger during system start-up, then continuously during operation. If it detects a failure or special status, an intermittent code will appear on the front instrument panel, displayed between dc output values.

The following table is a list of these error (**E ##**) and status (**A ##**) codes.

Code	Explanation
E 01	rating resistor R2 open or defective
E 02	short circuit on dc output
E 03	high dc voltage shutdown occurrence
E 04	internal memory failure
E 06	voltage sense failure (internal / external / remote)
E 07	dc breaker open, or dc output wiring defective
E 08	remote temperature compensation probe defective
E 10	open internal feedback loop
E 12	internal over-temp circuit defective
E 13	rectifier over-temperature occurrence
E 14	forced load sharing not working properly
A 01	manual equalize enabled for more than 24 hours
A 02	equalize mode inhibited
A 04	voltmeter calibration inhibited w/TempCo active
A 05	dc output at Current Limit setting
Pb / nicd	battery type for active temperature compensation
LS-P / LS-S	forced load sharing status (primary / secondary)

Codes **E 05**, **E 09**, **E 11**, and **A 03** are not used. See Section 3.2 on page 45 for a full explanation of each code.

2.2.2. Selecting the meter mode

- Press the **METER MODE** key to change the meter display mode. The digital meter has four operating modes:
 - 1. Alternating between output voltage and output current. When the AT10.1 is in a timed equalize mode, the meter alternates between output voltage, output current, and equalize hours remaining.
 - 2. Displaying output voltage only. The **DC Volts** indicator lights.
 - 3. Displaying output current only. The **DC Amperes** indicator lights.
 - 4. Displaying equalize hours remaining only. The **EQLZ HRS REMAINING** indicator lights. If the AT10.1 is not in a timed equalize mode, the meter displays the full programmed equalize time.
- When the AT10.1 starts initially, the meter alternates, displaying output voltage and output current. The **DC Volts** and **DC Amperes** indicators light alternately to indicate what is being displayed.

2.2.3. Selecting the Float or Equalize mode

The AT10.1 has two output voltage settings, Float and Equalize. Use the Float mode for all normal battery charging and to operate your dc system. Use the Equalize mode if it is necessary to balance the level of charge among the cells of the battery. Consult your battery data sheets for information on equalize-charging your battery.

- Press the **CHRG MODE** key to change to the equalize mode. If the equalize method is set to manual timer or auto-equalize timer, the AT10.1 will revert to float mode at the end of the selected equalize time.
- You can press the **CHRG MODE** key at any time to change back to the float mode.

2.2.4. Choosing the Equalize method

Press the **EQLZ MTHD** key to choose the desired equalize method. The indicator next to the desired equalize method will light. Three equalize methods are available in the AT10.1:

- Manual Timer
- Manual Equalize
- Auto-Equalize Timer

These equalize methods are described below.

Manual Timer Method

Choose the manual timer method if you perform regularly scheduled equalize charging, or if you base your equalize charging on regular readings of the specific gravity of each cell of your battery (for lead-acid batteries). When your battery requires equalize charging, adjust the manual timer to 1-2 hours for each 100 AH of battery capacity (see Section 2.3.3 to learn how to adjust the equalize time). The battery manufacturer can help you determine the best equalizing schedule for your battery.

After you select the manual timer method, press the **CHRG MODE** key to put the AT10.1 into the equalize mode. The **EQLZ** indicator will light. When the equalize timer is finished, the AT10.1 reverts automatically to the float mode, and the **FLOAT** indicator lights.

At any time during equalize charge, you can switch the AT10.1 back to float mode by pressing the **CHRG MODE** key. The **FLOAT** indicator will light.

If there is an ac power failure during a timed equalize charge, the AT10.1 remembers the remaining equalize time. When ac power is restored, it resumes the equalize charge where it left off.

Manual Equalize Method

Choose the manual equalize method when you want to equalize charge the battery, but only when you are able to monitor the battery voltage and gassing rate. After you select the manual equalize method, press the **CHRG MODE** key to put the AT10.1 into the equalize mode. The **EQLZ** indicator will light.

Press the **CHRG MODE** key again to return the AT10.1 to float mode. The **FLOAT** indicator will light.

NOTICE

Never leave the AT10.1 unattended in the equalize mode with the manual equalize method selected. A sustained overcharge may cause permanent damage to the battery.

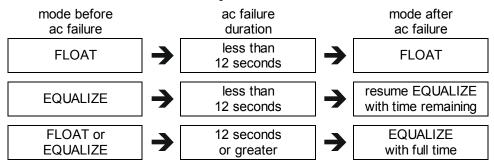
Auto-Equalize Timer Method

Select the auto-equalize timer method if you have a *flooded* (non-sealed) battery that is subject to infrequent discharges, or when the battery will be discharged to at least half of its rated capacity during an ac power failure.

When ac power is restored to the AT10.1, it will turn on in the equalize mode automatically, and the **EQLZ** indicator will light. At the end of the equalize charging-time that you select, the AT10.1 reverts automatically back to float mode, and the **FLOAT** indicator lights. At any time during the equalize charge, you can switch the AT10.1 back to float mode by pressing the **CHRG MODE** key. The **FLOAT** indicator will light.

Consult your battery manufacturer's instructions before using the auto-equalize timer method with sealed (valveregulated) lead-acid batteries.

Whenever the ac supply fails for 12 seconds or longer, the auto-equalize timer is enabled. For shorter periods, the timer behaves as listed below:



Switching to Equalize Mode with Auto-Equalize Timer Method Selected You can start an equalize charge at any time.

• Press the **CHRG MODE** key. The **EQLZ** indicator lights.

When the equalize timer is finished, the AT10.1 reverts automatically to float mode, and the **FLOAT** indicator lights.

2.2.5. Testing the front panel indicators

• Press the **DOWN** key. This is also the **LAMP TEST** key.

The meter will display 8888, and all status & alarm indicators will light.

The LAMP TEST key does not test the AC ON indicator. The AC ON indicator lights whenever ac power is present and the ac circuit breaker is turned on. The LAMP TEST key does not operate when ac power is off.

To test the action of the AT10.1 summary alarm relay, press and hold the **LAMP TEST** key for four seconds to transfer the relay. If you are monitoring the relay with a remote annunciator, it will detect the alarm condition.

2.2.6. Testing the Auxiliary Alarm Relay PC Board (optional)

If you have the optional Auxiliary Alarm Relay PC Board (A5) installed, you can similarly test the six individual alarm relays. Press and hold the **LAMP TEST** key for four seconds to transfer the relays. If you are monitoring the relays with a remote annunciator, it will detect the alarm conditions.

2.2.7. Interpreting the alarm indicators

There are six red alarm indicators at the right side of the front panel. An indicator lights for each of the following alarm conditions:

- **HIGH DC VOLTAGE**: lights whenever the dc output voltage exceeds the specified alarm voltage setting. See Section 2.3.4 to learn how to adjust the HVDC alarm setting.
- **LOW DC VOLTAGE**: lights whenever the dc output voltage is below the specified alarm voltage setting. See Section 2.3.4 to learn how to adjust the LVDC alarm setting.
- **DC OUTPUT FAILURE**: lights whenever the AT10.1 cannot provide its full rated output voltage *or* its full rated output current. You cannot adjust this alarm setting.
- **AC INPUT FAILURE**: lights whenever the ac power supply to the AT10.1 is interrupted.
- **POS GND**: lights whenever leakage current from the battery positive (+) terminal to ground exceeds a specified threshold. *
- **NEG GND**: lights whenever leakage current from the battery negative (-) terminal to ground exceeds a specified threshold. *
 - * The ground fault detection sensitivity can be adjusted from 5 to 30 k Ω , see Section 2.3.4 on Page 34.

When an alarm occurs, the indicators will light immediately. The AT10.1 also features a summary alarm relay with one form-C contacts (TB3) rated 0.5A / 125 Vac/Vdc. If an alarm condition lasts for 30 seconds or longer, the summary alarm relay transfers. Under standard settings, when the alarm condition is corrected, the corresponding relay and indicator resets automatically. Latching alarm capability for the AT10.1 is available, featured in a supplemental *Operating Instructions* (JA5098-00).

2.3. SETTING PARAMETERS IN THE AT10.1

2.3.1. Understanding Parameter Settings

You can change the settings of the AT10.1 while it is operating, using the front panel controls. The changes you make take effect immediately, and are saved internally. If the AT10.1 is taken out of service, and then later returned to service, it restarts using the last values you set. You can adjust the following parameters:

- Float voltage
- Equalize voltage
- Equalize timer (in hours)
- High dc voltage alarm setting
- Low dc voltage alarm setting
- Current Limit value (in Amperes)
- High dc voltage shutdown feature (on or off)

Your choice of equalize method is also saved internally.

When you want to change any parameter, press the **EDIT/ENTER** key to put the AT10.1 into **Edit Mode**. The meter display flashes about once per second, and the status indicators prompt you to adjust the respective parameter. Adjust each parameter by pressing the **UP** or **DOWN** key until the meter displays the desired reading. You can make the display scroll up or down continuously by pressing and holding the **UP** or **DOWN** key.

You cannot exceed certain upper and lower limits for the operating parameters. To see what the limits are for your AT10.1, refer to the Specifications in Appendix A on page 70.

When you first press the **EDIT/ENTER** key, the AT10.1 prompts you to adjust the first parameter in the list above (float voltage). When you obtain the value you want on the display, press the **EDIT/ENTER** key again. The AT10.1 saves the new setting internally, and then prompts you to adjust the second parameter. You continue this way to adjust the first six parameters in the list above. If you want to skip adjusting any parameter, just press the **EDIT/ENTER** key again. The AT10.1 moves to the next parameter.

When you are finished adjusting the sixth parameter (Current Limit), press the **EDIT/ENTER** key again. The AT10.1 saves all adjustments you made internally, and reverts to normal operation. The new settings take effect immediately.

If you do not press any front panel key for 25 seconds, **Edit Mode** ends automatically, and any change you made to the last setting is not saved.

2.3.2. Setting the Float and Equalize voltages

• Press the **EDIT/ENTER** key.

The **FLOAT** and **DC VOLTS** indicators light, and the display flashes the present value of the float voltage. Press and release the **UP** or **DOWN** key to increase or decrease the value in the display by one count, or press and hold the **UP** or **DOWN** key to scroll the value in the display upward or downward. When the meter displays the desired float voltage, release the **UP** or **DOWN** key. If you go past the voltage you want, press the **UP** or **DOWN** key again to reach the voltage you want to set.

• Press the **EDIT/ENTER** key. The new float voltage setting is saved internally.

The **EQLZ** and **DC VOLTS** indicators light, and the display flashes the present value of the equalize voltage. Press and release the **UP** or **DOWN** key to increase or decrease the value in the display by one count, or press and hold the **UP** or **DOWN** key to scroll the value in the display upward or downward. When the meter displays the desired equalize voltage, release the **UP** or **DOWN** key. If you go past the voltage you want, press the **UP** or **DOWN** key again to reach the voltage you want to set.

• Press the **EDIT/ENTER** key. The new equalize voltage setting is saved internally.

If you want to adjust the equalize timer duration, skip to Section 2.3.3.

OR

If you want to exit the **Edit Mode** now, press the **EDIT/ENTER** key four more times until the AT10.1 returns to normal operation.

If you do not press any front panel key for 25 seconds, **Edit Mode** ends automatically, and any change you made to the last setting is not saved.

2.3.3. Setting the Equalize Timer

Press the EDIT/ENTER key until the EQLZ HRS REMAINING,
 MANUAL TIMER and AUTO EQLZ TIMER indicators light, and the display flashes the present value of the equalize timer duration in hours.

Press and release the UP or DOWN key to increase or decrease the value in the display by one count, or press and hold the UP or DOWN key to scroll the value in the display upward or downward. When the meter displays the desired equalize time (in hours), release the UP or DOWN key. If you go past the number of hours you want, press the UP or DOWN key again to reach the number you want to set.

If you set the equalize time to zero hours, the equalize mode is disabled.

• Press the **EDIT/ENTER** key. The new equalize timer duration is saved internally. The timer setting works for both the manual timer and the auto-equalize timer.

If you want to adjust the alarm settings, skip to Section 2.3.4.

OR

If you want to exit the **Edit Mode** now, press the **EDIT/ENTER** key three more times until the AT10.1 returns to normal operation.

2.3.4. Setting the Alarms

After you save the equalize timer setting, the **Edit Mode** automatically prompts you to adjust the settings of the high dc voltage and low dc voltage alarms. There is a red indicator light on the front instrument panel of the AT10.1 for each of the following alarm conditions:

- High DC Voltage
- Low DC Voltage
- DC Output Failure
- AC Input Failure
- Ground Fault Detection (+)
- Ground Fault Detection (-)

When an alarm occurs, the indicators will light immediately. The AT10.1 also features a summary alarm relay with one form-C contacts (TB3), rated 0.5A / 125 Vac/Vdc. If an alarm condition lasts for 30 seconds or longer, the summary alarm relay contacts transfer. This can be monitored remotely from TB3. When the alarm condition is corrected, the relay and all indicators reset automatically. If latching alarms/relays are enabled the relay will need to be reset manually, see Section 2.2.7 on page 29.

The summary alarm contacts (TB3) also transfer when the AT10.1 detects certain secondary errors, indicated by meter display codes (**E 03**, **E 04**, **E 06**, **E 07**, **E 08**, **E 09**, **E 10**, **E 12**, **E 13**, and **A 01**), rather than a red alarm light. See Section 3.2 on Page 45 for all error and status codes.

Setting the High DC Voltage Alarm

 Press the EDIT/ENTER key until the HIGH DC VOLTAGE indicator flashes, and the display flashes the present value of the high dc voltage alarm.

Press and release the UP or DOWN key to increase or decrease the value in the display by one count, or press and hold the UP or DOWN key to scroll the value in the display upward or downward. When the meter displays the desired high dc voltage alarm point, release the UP or DOWN key. If you go past the voltage you want, press the UP or DOWN key again to reach the voltage you want to set.

• Press the **EDIT/ENTER** key. The new high dc voltage alarm setting is entered into permanent memory.

Setting the low DC Voltage Alarm

 Press the EDIT/ENTER key until the LOW DC VOLTAGE indicator flashes, and the display flashes the present value of the low dc voltage alarm.

Press and release the UP or DOWN key to increase or decrease the value in the display by one count, or press and hold the UP or DOWN key to scroll the value in the display upward or downward. When the meter displays the desired low dc voltage alarm point, release the UP or DOWN key. If you go past the voltage you want, press the UP or DOWN key again to reach the voltage you want to set.

• Press the **EDIT/ENTER** key. The new low dc voltage alarm setting is entered into permanent memory.

If you want to adjust the Current Limit setting, skip to Section 2.3.5.

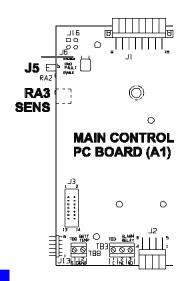
OR

If you want to exit the **Edit Mode** now, press the **EDIT/ENTER** key again to return the AT10.1 to normal operation.

Adjusting Ground Detection Sensitivity

The AT10.1 ground detection alarm sensitivity is adjustable from 5 to 30 k Ω . You must have a "test resistor" whose Ohmic value is the required ground sensitivity, and a small jeweler's screwdriver for adjustment.

The ground detection sensitivity is adjusted equally (+/-) from 5 to 10 k Ω , but slightly less equally from 10 to 30 k Ω . Adjustments are made via potentiometer labeled **RA3 SENS**, located on the Main Control PC Board (A1), as shown in the figure at the right.



NOTICE

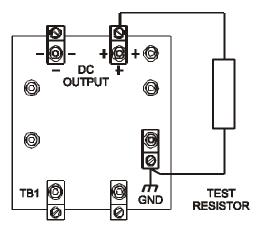
Do not try to adjust the upper potentiometer labeled **RA2 BALANCE**. This adjustment is made at the factory for proper circuit operation.

⚠ CAUTION

Before connecting or disconnecting a test resistor to the AT10.1, de-energize and lock out all ac and dc voltage sources.

Check with a voltmeter before proceeding. Restart the AT10.1 only when necessary to make the sensitivity adjustment. If your battery is grounded, do not attempt this procedure.

Remove the Plexiglas safety shield at the I/O panel board. Connect the test resistor between **TB1(+)** and ground. Adjust **RA3** counterclockwise until the front panel indicator goes out, then adjust clockwise until the **POS GND** indicator *just* lights. Make this adjustment slowly, for the indicator is only updated once every four seconds.



De-energize and lock out power to the AT10.1. Remove the test resistor at **TB1(+)** and verify the **POS GND** indicator goes out. Connect the test resistor between **TB1(-)** and ground. Verify that the **NEG GND** indicator lights. If not, adjust **RA3** clockwise until it *just* does.

Remove the test resistor and return the AT10.1 to normal operation.

Using Ground Detection in Charger Standby Mode

If you put the AT10.1 into standby mode by opening the dc circuit breaker (CB2), the ground detection circuit will send an erroneous *positive* (+) ground fault alarm. There are two ways to work around this:

- Disable the ground detection circuit while the AT10.1 is in standby, as described below.
- Put the AT10.1 into standby by opening the ac input circuit breaker (CB1), and leaving the dc output circuit breaker (CB2) closed.

Operating the AT10.1 with the ac breaker (CB1) closed, but the dc breaker (CB2) open, is an *abnormal* condition. It is not recommended.

Disabling the Ground Detection Alarm

You can disable the ground detection alarm circuit, and isolate the circuit from chassis ground. If your battery is normally grounded, or you want to defeat the alarm for any other reason, follow these steps:

- Shut down the AT10.1 and lock out all ac and dc voltage sources. This includes alarm and remote sense wires if they were installed. Open the front panel door and check with a voltmeter before proceeding.
- Locate jumper **J5** at the top left of the Main Control PC Board (A1) as shown on the previous page. Move the jumper to the **DISABLE** position. The **POS GND** and **NEG GND** indicators and the summary alarm relay (TB3) will not respond to a ground fault.

Restart the AT10.1, following the instructions in Section 2.1.

2.3.5. Setting the Current Limit value

The AT10.1 automatically limits its dc output current in case of overload or battery discharge. You can adjust the value of the Current Limit from 50% to 110% of rated current. The factory setting is 110%.

The Current Limit adjustment is the last step in the normal **Edit Mode** sequence. If the AT10.1 is not in the **Edit Mode**, press the **EDIT/ENTER** key five times, until the meter display flashes the value of the Current Limit setting (in Amperes). Press and release the **UP** or **DOWN** key to increase or decrease the value in the display by one count, or press and hold the **UP** or **DOWN** key to scroll the value in the display upward or downward. When the meters display the desired Current Limit value, release the **UP** or **DOWN** key. If you go past the number you want, press the **UP** or **DOWN** key again to reach the number you want to set.

- Press the **EDIT/ENTER** key.
- The new Current Limit setting is saved internally.

If you do not press any front panel key for 25 seconds, **Edit Mode** ends automatically, and any change you made to the last setting is not saved.

2.3.6. Enabling the High DC Voltage shutdown feature

The AT10.1 has a built-in high dc voltage shutdown feature. In case of any maladjustment or internal failure that results in a continuous output voltage that is too high, the AT10.1 shuts down after 30 seconds to protect the battery. The front panel meter displays code **E 03**, and the summary alarm relay contact (TB3) transfers.

NOTICE

The AT10.1 is normally shipped from the factory with the High DC Voltage Shutdown feature **disabled**.

You can adjust the high dc voltage shutdown (the setting is the same as the high dc voltage alarm setting). Refer to Section 2.3.4.

To enable the shutdown feature:

- The AT10.1 must be in normal operation (not the **Edit Mode**) to enable High DCV Shutdown.
- Press and hold the **UP** key, then...
- Press the **CHRG MODE** key.

The **HIGH DC VOLTAGE** indicator lights, and the display flashes **ON**. You can toggle the shutdown feature **OFF** and **ON** by pressing the **CHRG MODE** key repeatedly.

Parallel Operation

If two (or more) AT10.1s are connected in parallel, both sense the output voltage. If one AT10.1 runs away, it will supply all the output current. The other will have zero output current. The high dc voltage shutdown does not operate in an AT10.1 with zero output current, so that only the *defective* AT10.1 (of two or more in parallel) shuts down. The other AT10.1 will continue to supply the load normally.

If you do not press any key within four (4) seconds, the last state indicated (**ON** or **OFF**) is saved internally. Note that you *do not* use the **EDIT/ENTER** key for this feature.

If the AT10.1 shuts down because of a high dc voltage, the meter displays error code **E 03**. Reset the AT10.1 by turning the ac input circuit breaker (CB1) off, then on again.

2.3.7. Adjusting the Voltmeter Accuracy

The AT10.1 voltmeter is adjusted at the factory to display the actual output voltage within $\pm 0.25\%$. If you replace any component that affects meter accuracy, such as the Main Control PC Board (A1) or resistor (R4), you should readjust the meter. This adjustment procedure is different from all others, because the meter reading remains constant, while the output voltage of the AT10.1 changes. Do this adjustment with a fully charged battery and no load connected.

First, enter **Edit Mode** to adjust the float voltage to the desired value. See Section 2.3.2 for instructions on setting the float voltage. Second, press and hold the **UP** key, then press the **EQLZ MTHD** key.

The **DC VOLTS** METER MODE indicator will light, and the meter display flashes the output voltage reading. Measure the output voltage of the AT10.1 using a dc meter accurate to $\pm 0.25\%$ or better.

While watching the meter connected to the AT10.1 output (not the front panel meter), press the **UP** or **DOWN** key until the actual output voltage matches the float setting on the front panel meter.

Each time you press \overline{UP} or \overline{DOWN} , you change the AT10.1 output voltage by a small amount. Continue to press \overline{UP} or \overline{DOWN} until the actual output voltage agrees with the front panel reading within $\pm 0.25\%$.

NOTICE

Allow one or two seconds for the output voltage to stabilize each time you press the UP or DOWN key.

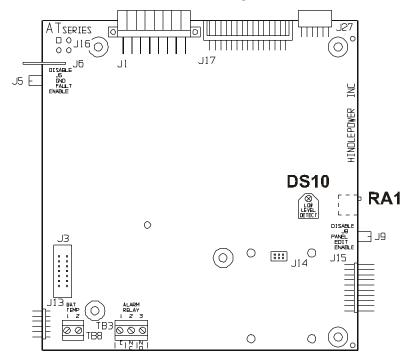
When you are finished adjusting the output voltage, the AT10.1 waits five (5) seconds, then the display returns to normal operation.

2.3.8. Using the Low Level Detector (LLD)

The AT10.1 is equipped with a summary (common) alarm relay safety override circuit. This feature forces the alarm relay contact to transfer, sending an alarm, even if there is a catastrophic failure of the AT10.1 control circuitry. A low battery voltage triggers the safety circuit.

Main Control PC Board (A1) hardware, not software, maintains the low level detect circuit. Therefore, to remotely monitor this alarm, user connections must be made at terminal block (TB3). The summary alarm contacts (TB4) on the Auxiliary Alarm Relay PC Board will not signal a low level detect alarm.

If you have a dc power supply, you can adjust the battery voltage that triggers the alarm. On the back of the Main Control PC Board (A1), find the potentiometer **RA1**, as shown in the figure below.



Disconnect all ac and dc power sources from the AT10.1, and connect your dc power supply to the charger dc output terminals (TB1+/-), positive to positive and negative to negative. Adjust the power supply to the voltage at which you want to activate the alarm.

NOTICE

You need at least 50% of the nominal output voltage to power the AT10.1 Main Control PC Board (A1).

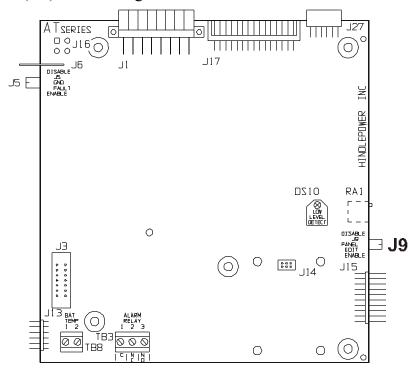
Adjust **RA1** with a small jeweler's screwdriver clockwise until the alarm just activates. A red LED indicator (**DS10**) next to **RA1** indicates when the alarm is active.

2.3.9. Using the front panel security feature

The AT10.1 is shipped from the factory with all front instrument panel keys enabled. You can disable the following front panel functions:

- Selecting Equalize method
- Changing settings using the **EDIT/ENTER** key
- Toggling the high dc voltage shutdown feature

To disable the front instrument panel keys, open the AT10.1 door and locate the small plastic jumper **J9** on the right side of the Main Control PC Board (A1). See the figure below.



Move the jumper up to the **DISABLE** position (pins 2 and 3). With this setting, only the front panel **METER MODE** and **CHRG MODE** keys will function. All indicators will still work normally. Return the jumper down to the **ENABLE** position (pins 1 and 2) to return all front panel key functionality.

2.4. PERFORMING ROUTINE MAINTENANCE

MARNING

High voltages appear at several points inside the AT10.1. Use extreme caution when working inside the enclosure. Do not attempt to work inside the AT10.1 unless you are a qualified technician or electrician.

Disconnect and lock out all power from the AT10.1 before starting to remove or replace any components. Turn the ac power off at the distribution panel upstream from the charger. Disconnect the battery from the AT10.1 output terminals TB1(+/-).

2.4.1. Keep it clean

The AT10.1 is cooled by natural convection. At least once a year, vacuum the vents at the top and bottom of the enclosure to ensure that there is an adequate supply of cooling air. If you have an extremely dusty environment (especially if airborne dust is conductive), *carefully* vacuum out the interior. Clean the surfaces of circuit boards, and clean around electrical terminals.

The AT10.1 is rated for operation up to 122° F / 50° C. If your installation is in a warmer environment, or at an elevation over 3000ft / 914m, contact your sales representative for operating information.

2.4.2. Check power and signal connections

Check the tightness of all field connections inside the AT10.1, and connections to the battery. A loose or corroded connection at the battery terminals can be a fire or explosion hazard, and may cause erroneous operation of the AT10.1.

2.4.3. Check remote sense wiring (optional)

If you wired the AT10.1 for remote sense, check the signal connections to the battery or load, making sure insulation is in satisfactory condition. If there is a failure of the remote sense signal wiring, the AT10.1 displays the error code **E 06**. The AT10.1 returns to local control, sensing the output voltage at the charger output terminals (TB1+/-).

2.4.4. Check temperature compensation probe (optional)

If you are using the optional temperature compensation probe, make sure that the probe (A10) is securely installed. Make sure the connectors and the wiring from the probe to the AT10.1 are in satisfactory condition.

If there is a failure of the temperature compensation probe, or the wiring, the AT10.1 displays the error code **E 08**.

2.4.5. Measuring the output ripple voltage (filtered models only)

If your AT10.1 is a filtered model, measure the ac ripple at the battery terminals at least once a year. Use an rms responding ac voltmeter. If the battery Ampere-hour capacity is at least four (4) times the output current rating of the AT10.1, the ripple voltage should be no higher than the value featured in the specifications in Appendix A on page 70.

If you suspect that the output ripple voltage is too high, see "Output ripple voltage too high" of the *Troubleshooting Chart* in Section 3.4, page 53.

2.4.6. Viewing the voltage and alarm settings

You can review the parameter settings in the AT10.1 by pressing the **EDIT/ENTER** key on the front instrument panel. Each time you press the key, a different parameter displays, in the following order:

- Float voltage
- Equalize voltage
- Equalize time (in hours)
- High dc voltage alarm setting
- Low dc voltage alarm setting
- Current Limit (in Amperes)

Do not use a dc voltmeter. The ripple voltage on a battery is a very small ac voltage.

SAMPLE PREVENTIVE MAINTENANCE PROCEDURE AT10.1 BATTERY CHARGER (JD0064-00)

Suggested Frequency: every six (6) months

Maintenance date	Performed by	
	⚠ WARNING	

High voltages appear at several points inside the AT10.1. Use extreme caution when working inside the enclosure. Do not attempt to work inside the AT10.1 unless you are a qualified technician or electrician.

Step (standard features)	Instructions	Results
Clean AT10.1	All vents clean and open.Remove dust and debris from inside unit.	□ OK □ OK
Check all electrical connections and wiring	 TB1 connections all tight. Internal wiring connections tight, slip-on connectors fully seated. Wire and lug insulation in satisfactory condition. Terminations at battery or dc bus are tight and corrosion free. 	□ OK □ OK
Check ac input voltage	Measure between TB1-L1 and TB1-L2 using an ac voltmeter. Value must be within +10% & -12% of nominal voltage.	Input Vac
Check dc output voltage	• Measure at TB1(+) and TB1(-) using a dc voltmeter. Value should agree with front panel voltmeter within +/-0.25%, and must be correct values for your battery. If the AT10.1 is using a temperature compensation probe, see the graph on page 23 to determine correct battery voltage. You need to know the battery temperature for this step.	FloatVdc EqualizeVdc
Check ripple voltage Test font panel	 Measure at battery terminals using an ac voltmeter set to the milliVolts scale. Check against specification in Appendix A on page 70. Press LAMP TEST key on front panel. 	Ripple mVac
indicators Test summary alarm relay	Press LAMP TEST key and hold for four (4) seconds. Summary alarm relay at TB3 will transfer.	ОК

OPERATING THE AT10.1

Exercise front panel controls	Switch from float to equalize, then back to float.	□ ок
paner controls	 Turn off the dc circuit breaker. E 07 may appear on display (requires at least 5% of rated output current). Reset breaker. 	□ ок
	Cycle through meter modes.	□ volts OK
		☐ AMPERES OK
		☐ HOURS OK
	• Cycle through equalize methods.	☐ MANUAL TIMER OK
		MANUAL EQLZ OK
		AUTO EQLZ TIMER OK
	Turn off ac circuit breaker. The AC	☐ Alarm OK
	INPUT FAILURE indicator should light. Reset breaker.	
Check voltage	Use EDIT/ENTER key to scroll through	☐ FLOAT OK
and alarm	settings. See page 30.	☐ EQUALIZE OK
settings		☐ HVDC alarm OK
		LVDC alarm OK
Fig. 1 also also	M	Current Limit Adc
Final checks	 Make sure Plexiglas safety shield is in place. 	□ ок
	 Restore AT10.1 to normal operation. 	□ ок
	• Close latch on front panel.	OK
Step (optional features)	Instructions	Results
Test auxiliary alarm relays	• Press LAMP TEST key and hold for four (4) seconds. Alarm relays will transfer.	□ ок
Check	• Remote sense wiring. See page 16.	□ OK
integrity of	• Temperature compensation wiring. See	□ ок
remote wiring	page 20.	□ OK

Temperature compensation probe. See

Close padlock or key lock.

ONLINE SUPPLEMENTS

Final checks

Preventive Maintenance Procedure Downloadable Worksheet

page 20.

http://www.ATSeries.net/PDFs/JD0064-00.pdf

□ ок

3.1. A STEP-BY-STEP TROUBLESHOOTING PROCEDURE

The AT10.1 is fully tested and calibrated from the factory, and should work for years with a minimum of attention. If you do encounter trouble, there are three (3) steps you should take to identify the problem and return the AT10.1 to service.

- 1. Check the front panel meter for an error code. The microprocessor control circuitry is able to diagnose common problems with the AT10.1, or with the installation or application. If the front panel displays an error code, see Section 3.2, *Interpreting Front Panel Error Messages*, for help in interpreting the code and solving the problem.
- 2. If the AT10.1 does not work properly, but there is no front panel error code, turn off both front panel circuit breakers (CB1/CB2), or disconnect ac and dc power externally. Turn back on dc power *first*, followed by ac power. This will return the AT10.1 to normal operation as long as there is no internal component failure.

NOTICE

Perform Step 2 only once. If the AT10.1 does not resume normal operation, go on to Step 3.

- 3. If the AT10.1 still does not work properly, make a list of the symptoms that you observe. Turn to *Using the troubleshooting chart* in Section 3.3. The troubleshooting chart relates common trouble symptoms to their causes, and gives the proper procedures for correcting the problem.
- 4. If the symptom does not appear on the troubleshooting chart, or if the recommended repair does not work, consult your sales or service representative to arrange for on-site or factory service.

3.2. INTERPRETING FRONT PANEL ERROR MESSAGES

If the AT10.1 control circuitry detects hardware or wiring problems, it may display an error code on the front panel meter. Certain non-error status codes are also displayed. To solve an error code problem, refer to the table below, which lists the codes and procedures to use.

⚠ WARNING

High voltages appear at several points inside the AT10.1. Use extreme caution when working inside the enclosure. Do not attempt to work inside the AT10.1 unless you are a qualified technician or electrician.

Disconnect and lock out all power from the AT10.1 before starting to remove or replace any components. Turn the ac power off at the distribution panel upstream from the charger. Disconnect the battery from the AT10.1 output terminals TB1(+/-).

Error Code	Meaning	Repair Procedure
E 01	resistor R2 open or defective	The Rating Resistor (R2) is installed at the back of the front panel, in the Main Control PC Board (A1) input connector (J1). R2 is measured by the control circuitry on startup, and is used to determine some of the AT10.1 model-specific parameters, such as the float voltage.
		If the AT10.1 detects that R2 is defective (or improper), it must be replaced. See Section 3.6 for parts ordering information. When you have completed the repair, restart the AT10.1 according to Section 2.1.
E 02	short circuit on dc output	The AT10.1 may display this error code if the battery is discharged to less than 6 volts. When the battery re-charges to greater than 6 volts, the error code will disappear. If you have a seriously discharged battery, allow the AT10.1 to run for 24 hours and check the battery voltage again. If it has not increased to the normal voltage rating, consult the battery manufacturer for help.
		If the battery voltage is normal, check the wiring at the AT10.1 dc output terminals (TB1+/-) for a short circuit.
		If the battery voltage is normal, and all external wiring is satisfactory, check the AT10.1 dc breaker (CB2). If it is tripped, try once to reset it. If it trips again immediately, there may be an internal short circuit in the AT10.1. Check the internal wiring. If the AT10.1 is filtered, check the dc filter capacitors (C1/C2) and the polarity diode (CR1).
		The AT10.1 normally recovers automatically from an E 02 condition. If you have shut down the AT10.1 for service, restart per Section 2.1.
E 03	High DC Voltage Shutdown	To restart the AT10.1, turn the ac breaker (CB1) off, then on. Check the Equalize voltage and High DC Voltage alarm settings. The HDCV alarm setting must be higher than the Equalize voltage setting.
	activated	If you get another High DC Voltage shutdown after a few minutes of operation, there may be an internal component failure. See AT10.1 output voltage too high, or not controllable of the troubleshooting chart on page 52 in Section 3.4.

Error Code	i weaning	Repair Procedure
E 04	internal memory failure	Any parameters that you set, such as Float or Equalize voltage, are saved internally. The internal memory is tested on startup. If the memory test fails, E 04 appears on the front display. The error may also appear if the controller was trying to write to the memory while a power failure occured.
		If an E 04 code appears, try shutting down the AT10.1. Restart by turning on the dc breaker (CB2) <i>first</i> , followed by the ac breaker (CB1). If the AT10.1 restarts normally, you must reenter any changes you made to the factory settings (float voltage, etc.).
		If E 04 appears repeatedly, the internal memory has been damaged. You must replace the Main Control PC Board (A1). See Section 3.6 for parts ordering information.
E 05	not used	This error code was formerly used to indicate a reverse battery connection. It is not available in the AT10.1.
E 06	defective R4 or R14 resistor, or remote sense wiring failure	Identify the Positive (+) Scaling Resistor (R4) mounted to TB5, on the back side of the front instrument panel. Remove the resistor and measure its value with an Ohmmeter (see table 3-1 for the correct value). If the resistor is not within 1% of the specified value, it must be replaced.
	J	Identify the Negative (-) Scaling Resistor (R14) inside the enclosure, connected to TB1(-). Remove the lugged end and measure the resistor's value with an Ohmmeter (see table 3-1 for the correct value). If the resistor is not within 1% of the specified value, it must be replaced.
		If you are using remote sense wiring from the battery to the AT10.1, the wiring may have failed. The usual failure is an open circuit. A short circuit will usually be indicated by smoke or fire in the wiring.
		The AT10.1 displays error code E 06 if it detects this wiring failure. You should respond to this problem <i>quickly</i> , to make sure the AT10.1 regulates the output voltage properly. Wire an annunciator (e.g. buzzer) to the summary alarm relay contact (TB3) for remote indication of any charger problem. Otherwise monitor the AT10.1 operation using the optional DNP Level 3 / MODBUS Communications Module (<u>JA0102-04</u>).
		If a failure exists in remote sense wiring, the AT10.1 regulates its output voltage locally until you correct the problem, see Section 1.9. The locally controlled voltage may not reflect the true requirements of the battery.
	_	When you complete the repair, restart the AT10.1 per Section 2.1.
E 07	open dc breaker (CB2) or internal dc	If the dc breaker (CB2) is open, open the ac breaker (CB1). Restart by closing the dc breaker (CB2) <i>first</i> , followed by the ac breaker (CB1). If the dc breaker trips again, see the troubleshooting chart in Section 3.4.
	wiring failure	If the dc breaker (CB2) is closed, but the front panel meter dsiplays E 07 , check your battery. If the battery is disconnected, and you <i>then</i> disconnect the dc load, the AT01.1 may display an E 07 code. Restart the AT10.1 according to Section 2.1.
		If the battery and dc load are satisfactory, see the troubleshooting chart in Section 3.4 for help in locating the problem.
E 08	defective	See <i>Application Note</i> (<u>JD5003-00</u>) for more detailed user instructions.
	temperature compensation probe	If a remote temperature compensation probe (A10) is connected to the AT10.1, the control circuitry detects the probe on startup and uses the temperature measured by the probe to control the output voltage of the charger. To understand temperature compensation, see Section 1.11.
		If the probe (A10) or the wiring that connects it to the Main Control PC Board (A1) fails during normal operation, the AT10.1 detects the failure and displays E 08 on the front panel meter.

Error Code	Meaning	Repair Procedure
E 08	defective temperature compensation probe	Disconnect the wiring at the probe and measure the resistance across the quick-connect leads with an Ohmmeter. The resistance should measure approximately 10,000 Ω at normal room temperature (77° F / 25° C). If the probe reads open or shorted, it needs to be replaced.
	(continued)	If the probe is satisfactory, examine the wiring between the probe and the AT10.1. Also, check the connection of the cable to TB8 on the Main Control PC Board (A1) on the back of the front panel. If the wiring is satisfactory, the probe needs to be replaced. Once you have replaced the probe, you must restart the AT10.1 to activate temperature compensation.
E 09	misadjusted Current Limit	This code has been discontinued with Main Ctrl PCB firmware version 6.52. See <i>Application Note</i> (<u>JD5035-00</u>) for a description of this code.
E 10	open internal feedback loop	A redundant internal feedback loop (control loop) is provided to increase reliability when remote sensing is used. If there is a problem with the internal loop wiring, the front panel meter will display E 10 .
		Check the internal wiring in the signal harness, especially wire # 33. Also check the harness connector (J1) on the Main Control PC Board (A1).
E 11	not used	This error code is not implemented at this time.
E 12	defective internal thermostat	The AT10.1 rectifier heat sink assembly has been equipped with a non-standard over-temperature thermostat (S2). On startup, the AT10.1 tests the thermostat, and displays E 12 if it is defective.
		Check the thermostat (S2) for continuity. Disconnect the wiring and resistor (R28) from the quick-connect terminals. The thermostat switch should be closed (NC) at normal room temperature.
E 13	internal over- temperature	The non-standard rectifier thermostat (S2) has detected an over- temperature condition. If the rectifier is equipped with a fan (B2), check the fan for proper operation. Also make sure that all enclosure vents are clear of debris, and that the ambient temperature is below 50°C (122°F).
E 14	forced load sharing not working properly	See Appendix F on page 90. Verify both AT10.1s are functioning properly. Ensure that the forced load sharing interconnection cable assembly is not broken, is properly installed, and that the connector for the Secondary charger has the jumper as described. Ensure that both AT10.1s are connected to the same ac supply, and that source phase rotation is the same for both AT10.1s.
A 01	manual eqlz enabled for more than 24 hr	If the AT10.1 was accidentally left in manual equalize mode, switch the unit back to float, manual equalize timer, or auto-equalize timer mode, according to Section 2.2.4 on Page 27.
A 02	equalize mode inhibited	If you set the equalize timer to zero (0) hours, the equalize mode is inhibited. When you try to put the AT10.1 into equalize mode from the front panel controls, the meter displays status code A 02 . If you want to enable the equalize mode, set the equalize timer to one (1) or more hours.
A 04	voltmeter calibration inhibited w/TempCo active	While using temperature compensation, the AT10.1 internal dc voltmeter cannot be calibrated. Disconnect one wire of the TempCo cable from TB8 on A1. Restart the AT10.1 and perform the voltmeter calibration according to Section 2.3.7 on Page 37. Reconnect the TempCo cable to TB8, and restart the AT10.1. See <i>Application Note</i> (<u>JD5003-00</u>) for further details.
A 05	dc output at Current Limit setting	The AT10.1 is in Current Limit mode. This will occur when there is a large load on the dc bus, or the battery has discharged. Make sure that the AT10.1 is sized correctly for the application, and that the Current Limit value has been set correctly. See Section 2.3.5 on Page 35.

3.3. USING THE TROUBLESHOOTING CHART

⚠ WARNING

High voltages appear at several points inside the AT10.1. Use extreme caution when working inside the enclosure. Do not attempt to work inside the AT10.1 unless you are a qualified technician or electrician.

Disconnect and lock out all power from the AT10.1 before starting to remove or replace any components. Turn the ac power off at the distribution panel upstream from the charger. Disconnect the battery from the AT10.1 output terminals TB1(+/-).

Before you try to use the troubleshooting chart, be sure that you have followed the steps in Section 3.1.

The troubleshooting chart that begins on the next page is divided into three (3) columns. To use the chart:

- 1. Make a list of the AT10.1's condition, including the trouble symptoms.
- 2. Find the symptom(s) in the first column of the chart.
- 3. The middle column contains common causes for the problem you observe, in order of probability.
- 4. Follow the action described in the right-hand column to correct the problem and return the AT10.1 to normal service.

Determining the condition of the AT10.1:

- Is the front panel **AC ON** indicator lit?
- What is the ac voltage at the input terminals (measured with an ac voltmeter)?
- What is the dc voltage at the output terminals (measured with a dc voltmeter)?
- Does the front panel meter display any voltage or current?
- Are any alarm indicators lit?
- Do the front panel status indicators work (Charge Mode, for example)?
- Can you change the AT10.1 to the Equalize mode, then back to Float?
- Is the AT10.1 making any noise? Is it unusually loud?
- Is there any sign or smell of smoking or burning?

While using the Troubleshooting Chart, refer to the internal component layout drawings and connection diagrams in Appendix C. For instructions on replacing components, see Section 3.5.

3.4. TROUBLESHOOTING CHART

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
Front panel meter displays all segments on	1. An external surge has interrupted operation of the	1A. Soft Reset of control board by pressing S7 reset switch. S7 is located inside the AT10.1, on the control board's right edge (as viewed from the rear of the front panel). This will restart the control board without modifying any settings.
or all segments off AT10.1 may have no output	microprocessor or the display controller.	1B. Hard Reset of control board by pressing and holding the "UP" button on the front instrument panel, and simultaneously pressing S7 reset switch. This will restart the control board and restore all settings to factory default. Reset parameters per Section 2.3 of this manual.
		1C. Remove all power from AT10.1 to allow control board to discharge all voltages. This can be done by opening the AC circuit breaker and disconnecting the control board plug(s). Keep power removed for approximately five (5) minutes to allow voltages to discharge.
AC breaker (CB1) trips immediately	1. Shorted rectifier diode or SCR	1. Disconnect wire # 12 from the rectifier Gate Driver PC Board (A3-X1). Measure the resistance between the two top rectifier terminals (labeled "AC" on the connection diagram), checking both polarities. It should be at least 100,000 Ω . If resistance is low in either direction, replace the Rectifier Assembly (A6).
	2. Defective wiring to T1 or to the rectifier heat sink assembly (A6)	2. Check spacing of terminals. Check wiring for signs of insulation damage, burns, etc. Repair as necessary.
	3. Defective transformer T1	3. Test by disconnecting wires from X1, X4, Y1 and Y2. If ac breaker still trips, replace T1.
AC breaker (CB1) trips after a few	Loose connection to breaker	Check and tighten connections as required.
minutes	2. Wrong ac voltage, or T1 taps mis-wired	2. Be sure the T1 primary taps are wired correctly for your input voltage. See Section 1.6 for details.
	3. Open SCR	3. Use a clamp-on ammeter to measure the current in wire # 11 or # 12. If it less than 70% of the dc output current, one of the SCRs or diodes is defective. Replace the rectifier module.
	4. SCR not controllable	4. Disconnect wire # 24 from terminal E3 of the rectifier assembly (near the left front of the enclosure). Restart the AT10.1. If You are able to measure output current, one of the SCRs is defective. Replace the rectifier module.
DC breaker (CB2) trips immediately	Battery connected with reverse polarity	Check and correct battery wiring if necessary.
-	2. Defective rectifier bridge (if UN-filtered AT10.1)	2. Test by disconnecting wire # 12 from the rectifier assembly. Measure resistance between the two top rectifier terminals (labeled "AC" on the wiring diagram). It should be at least 100,000 Ω (check both polarities). Replace rectifier assembly if resistance is low in either direction.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
DC breaker (CB2) trips immediately (continued)	3. Defective free-wheeling diode in SCR module (A16)	3. Remove wire # 13 from the rectifier Gate Driver PC Board (A3). Test the A16 SCR module's internal free-wheeling diode by measuring the resistance from E2 to E10 on A3 with an Ohmmeter. The reading should be at least 100,000 Ω in one polarity, and less than 1,000 Ω in the other polarity. If it is defective replace the entire Rectifier Assembly (A6).
	4. Defective polarity diode (if filter assembly is installed)	4. Remove wire # 15 from terminal E14 on the CR1 heat sink. Measure the resistance from the heat sink to E8 on the Gate Driver PC Board (A3) at the left front of the AT10.1 (check both polarities). If the resistance is less than 1,000 Ω in both directions, replace the filter assembly.
	5. Defective wiring	5. Check spacing of terminals. Check wiring for signs of insulation damage, burns, etc. Repair as necessary.
DC breaker (CB2) trips after a few	Loose connection to breaker	Check and tighten connections as required.
minutes	2. Open SCR	2. Use a clamp-on ammeter to measure the current in wire # 12 or # 11. If it less than 70% of the dc output current, then one of the SCRs or diodes is defective. Replace the rectifier module.
	3. SCR not controllable	3. Disconnect wire # 24 from terminal E3 of the rectifier assembly (near the left front of the enclosure). Restart the AT10.1. If You are able to measure output current, one of the SCRs is defective. Replace the rectifier assembly.
	4. Defective Main Control PC Board (A1)	4. If the front panel meter displays more than 110% of rated dc current, the control board may be defective. Disconnect wire # 24 as above. If the output current goes to zero, replace the Main Control PC Board (A1).
No output current, but	1. AC supply failure	If AC ON indicator is out, check feeder circuit breaker or fuse.
ac & dc breakers (CB1/CB2)	2. Input Fuse (F1) is blown (480 Vac input	2. Remove the 480 Vac Input Fuse (F1) from its fuse holder (located on the bottom of the enclosure) and check with an Ohmmeter or fuse tester. Replace if required.
AC ON lamp is out	only)	NOTICE If the new fuse blows, see the sections titled "AC breaker trips immediately" and "AC breaker trips after a few minutes" for further troubleshooting hints.
	3. Defective wiring	3. Check the terminals and wiring between the transformer (T1) and the rectifier assembly, inductor (L1), dc filter (if present), the dc breaker (CB2), and the output terminals (TB1+/-). Check wire # 29 from T1-Y1 and wire # 28 from T1-Y2 to the Main Control PC Board connector (A1-J1). Repair as necessary.
	4. Defective transformer T1	4. Use an ac voltmeter to measure the ac voltage from T1-X1 to X4. It is normally 50% to 80% higher than the rated dc output voltage. If it is too low, check the wiring of the primary taps. See Section 1.6 for details. If it is zero, replace T1.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
No output current, but ac & dc	Battery is fully charged	This is normal operation in a system with little or no dc load. As long as the AT10.1 maintains Float voltage, it is operating normally.
breakers (Cb1/CB2) are on AC ON lamp	2. Float or Equalize voltage set too low	2. Check the Float and Equalize voltages and adjust them if necessary. Consult your battery manufacturer for the proper voltage settings.
is on	3. Wrong ac input voltage, or T1 taps miswired	3. Be sure the T1 primary taps are wired correctly for your input voltage. See Section 1.6 for details.
	4. Defective wiring5. Defective	 4. Check terminals and wiring between T1 and the rectifier assembly, inductor L1, dc filter (if present), the dc breaker, and the output terminals. Repair as necessary. 5. Use an ac voltmeter to measure the voltage between
	rectifier bridge	terminals E3 and E4 of the Gate Driver PC Board (A3). If you measure about 1.0 Vrms, but there is no output current, replace the entire Rectifier Assembly (A6).
	6. Defective Main Ctrl PC Board (A1)	6. If you do not measure any ac voltage in Step 5 above, and the battery voltage is less than the Float voltage setting, replace the Main Control PC Board (A1).
	7. Defective transformer T1	7. Use an ac voltmeter to measure the ac voltage from T1-X1 to X4. It is normally 50% to 80% higher than the rated dc output voltage. If it is too low, check the wiring of the primary taps. See Section 1.6 for details. If it is zero, replace T1.
	8. Defective inductor L1 or L2	8. Disconnect the wiring from L1 and measure the resistance between the terminals. If it is an open circuit, replace L1. Repeat for L2 if the optional dc filter is installed.
	9. Defective CR2	9. Disconnect wire # 52 from L1 to CR2, then check CR2 with an Ohmmeter (check both polarities). If CR2 is open, replace the filter assembly. This is a very rare occurrence.
	10. Defective dc breaker	10. Disconnect the battery, and connect a light dc load to the AT10.1. Measure the dc voltage from the input terminal to the output terminal of the circuit breaker, with the breaker on. It is normally no more than 50 millivolts. If it is near the rated output voltage, replace the breaker.
Front panel is dead, but ac & dc voltages	1. Main Control PC Brd (A1) is not connected	1. Make sure the connector at the top edge of the Main Control PC Board (A1-J1) is firmly seated.
are present at TB1	2. Defective Main Ctrl PC Board (A1)	2. If the AC ON indicator is lit, but the rest of the front panel is dead, replace the Main Control PC Board (A1).
	3. Defective wiring	3. Check the harness wiring to the Main Control PC Board connector (A1-J1) for signs of insulation damage, burns, etc. Be sure all wires are securely crimped in the connector.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
Front panel dies during ac power failure, but dc voltage is present at TB1	1. Defective Power Supply Ballast Resistor (R3)	1. Use a dc voltmeter to measure the dc voltage from E17 on the I/O panel to TB1(-). It is normally 12 Vdc when the rated output voltage is at TB1(+) and TB1(-). Remove all power from the AT10.1, and measure the resistance from TB1(+) and E17. See the table in Section 3.6 for the proper resistance values. If the resistance is not within 10% of the table value, replace R3.
	2. Defective wiring	2. Remove the enclosure shroud, and check the wiring to and from TB1 and the Main Control PC Board (A1) for signs of insulation damage or burns. Repair any damaged wiring.
AT10.1 output voltage too high, or not	1. Defective SCR	1. Disconnect wire # 24 from terminal E3 of the rectifier assembly (near the left front of the enclosure). Restart the AT10.1. If You are able to measure output current, one of the SCRs is defective. Replace the rectifier assembly.
controllable	2. R4 or R14 is defective, or wrong value	2. Remove one end of R4 from TB5 (on the back of the front panel). Repeat for R14 connected to TB1(-). Measure their values with an Ohmmeter. See the table in Section 3.6 for resistance values. If either resistor is not within 1% of the specified value, it must be replaced.
	3. Defective temperature compensation probe (optional)	3. Remove the leads from the probe and measure its resistance. At 77° F / 25° C the resistance should be about 10,000 Ω . If it is not, replace the probe assembly.
	4. Defective Main Control PC Board (A1)	4. If the front panel meter displays more than 110% of rated dc current, the Main Control PC Board (A1) may be defective. Disconnect wire # 24 from terminal E3 of the rectifier assembly (near the left front of the enclosure). Restart the AT10.1. If the output current goes to zero, replace the Main Control PC Board (A1).
Output voltage does not agree with front panel meter	Temperature compensation probe is installed	1. If the optional temperature compensation probe is installed, the output voltage may be different from the selected float or equalize voltage. The difference in the voltages depends on the probe temperature. The front panel meter always displays the proper voltage for 77° F / 25° C.
	2. Main Control PC Board (A1) or another component may have been replaced	2. Recalibrate meter as described in Section 2.3.7.
	3. R4 or R14 is defective, or wrong value	3. Remove one end of R4 from TB5 (on the back of the front panel). Repeat for R14 connected to TB1(-). Measure their values with an Ohmmeter. See the table in Section 3.6 for resistance values. If either resistor is not within 1% of the specified value, it must be replaced.
	4. Defective Main Control PC Board (A1)	4. Turn off both front panel circuit breakers. Restart by turning on the dc breaker (CB2) <i>first</i> , followed by the ac breaker (CB1). If the AT10.1 still has the wrong output voltage, replace the Main Control PC Board (A1).

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
AT10.1 never reaches float or equalize voltage (within 1%)	Current Limit set too low	1. If the AT10.1 is not in the Edit Mode , press the EDIT/ENTER key five times, until the meter display flashes the Current Limit value (in Amperes). If the Current Limit is less than 110%, adjust it to 110% as described. See <i>Setting the Current Limit value</i> , Section 2.3.5 for details.
	2. Defective battery or dc load, or load is too great	2. Check each cell of the battery. If one or more cells are shorted, the AT10.1 may not be able to reach the Float voltage. You may have the same problem if the normal load current is more than the rated output current of the AT10.1.
	3. Wrong ac input voltage, or voltage too low, or T1 wired incorrectly	3. Make sure the T1 primary taps are wired correctly for your input voltage. See <i>Changing Transformer Taps</i> , Section 1.6 for details. The actual ac input voltage must be at least 88% of the rated value for the AT10.1 to produce full output power.
	4. Defective rectifier bridge	4. Use a clamp-on ammeter to measure the current in wire # 12 or # 11. If it less than 70% of the dc output current, one of the SCRs or diodes is defective. Replace the rectifier module.
	5. Defective Main Control PC Board (A1)	5. Turn off both front panel breakers. Turn on the dc breaker (CB2) <i>first</i> , followed by the ac breaker (CB1). If the AT10.1 output current is below the Current Limit value, but it still has the wrong output voltage, replace the Main Control PC Board (A1).
Input current too high	1. Wrong ac input voltage, or transformer (T1) wired incorrectly	1. Be sure the T1 primary taps are wired correctly for your input voltage. See <i>Changing Transformer Taps</i> , Section 1.6 for details. The actual ac input voltage must be at least 88% of the rated value for the AT10.1 to produce full output power.
	2. Defective rectifier bridge	2. Disconnect wire # 24 from terminal E3 of the rectifier assembly (near the left front of the enclosure). Restart the AT10.1. If You are able to measure output current, one of the SCRs is defective. Replace the rectifier assembly.
	3. Defective Transformer (T1)	3. Test by disconnecting wires from X1, X4, Y1 and Y2. If ac input current is still too high, replace T1.
Output ripple voltage too high	1. AT10.1 is UN-filtered	Verify by checking nameplate against the ordering code on the inside front cover. Order and install filter option if necessary.
	2. Battery is disconnected or defective	Be sure battery is connected. Inspect battery according to the manufacturer's instructions.
	3. Battery too small for charger rating	3. Check the measured ripple against the specification for your AT10.1 model on page 70. The ripple rating is for a battery whose Ampere-hours are four (4) times the charger Ampere rating. For a smaller battery, ripple voltage may be higher.
	4. One or more defective filter capacitors, C1 or C2	4. Test with capacitance meter. Replace as necessary.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
AT10.1 very noisy	1. Loose hardware or enclosure panel	Remove the enclosure shroud. Check and tighten all component mounting hardware. Replace the shroud, being sure all assembly hardware is secure.
	2. Defective rectifier bridge	2. Use a clamp-on ammeter to measure the ac current in wire # 11 or # 12 (connected between T1 and the rectifier assembly). If it less than 70% of the dc output current, one of the SCRs or diodes is defective. Replace the rectifier module.
Meter readings are erratic	Defective or disconnected battery	1. Turn off the AT10.1. With a light dc load connected to the battery, be sure each cell reads the nominal cell voltage (2.0V for lead-acid, 1.25V for Ni-Cd). Restart the AT10.1. Each cell should now read the nominal Float voltage (2.2V for lead-acid, 1.35V for Ni-Cd).
	2. Defective scaling resistor R4 or R14	2. Remove one end of R4 from TB5 (on the back of the front panel). Repeat for R14 connected to TB1(-). Measure their values with an Ohmmeter. See the table in Section 3.6 for resistance values. If either resistor is not within 1% of the specified value, it must be replaced.
	3. Defective Main Control PC Board (A1)	3. If the output voltage is constant, replace the Main Control PC Board (A1).
Lamp test key	1. No Vac	1. The lamp test key does not work during an ac power failure.
does not work, or some lamps do not light	2. Main Control PC Board (A1) is not secured to front panel	2. Open the front panel, and make sure that the Main Control PC Board (A1) is securely mounted on the standoffs on the back of the panel. All indicators should extend about 0.125in / 3.2mm through the front of the panel.
	3. Defective Main Control PC Board (A1)	3. When you press the LAMP TEST key, if some but not all of the indicators light, or the digital meter does not display all 8's, replace the Main Control PC Board (A1).
One or more front panel	Front panel is locked	1. Open the front panel, and be sure that jumper J9 on the Main Control PC Board (A1) is in the ENABLE position.
keys do not work	2. Main Control PC Board (A1) is not secured to front panel	2. Open the front panel, and be sure that the Main Control PC Board (A1) is firmly seated on the standoffs on the back of the panel. Front panel keys must operate freely.
	3. Defective Main Control PC Board (A1)	3. Turn off both front panel circuit breakers. Turn on the dc breaker (CB2) <i>first</i> , followed by the ac breaker (CB1). If some of the front panel keys still do not work, replace the Main Control PC Board (A1).
Two AT10.1s connected in parallel, but only one has output current	1. If the forced load sharing option is not supplied, check for normal operation of both AT10.1s	1. Multiple AT10.1s are not designed to share load current, without the optional forced load sharing cable installed. When two or more AT10.1s are connected in parallel without this option, it is normal for one of the units to have no output current. You can check the operation of the "off" AT10.1 by increasing its Float voltage until it starts to deliver output current. When you have finished the test, be sure both AT10.1s are set to the same Float and Equalize voltages.
	2. EJ5126-## option	2. See Appendix F on page 90 for troubleshooting of Forced Load Sharing feature.

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
HIGH DC VOLTAGE indicator is on	High DC Voltage alarm and Equalize voltage settings are mismatched	1. Be sure that the High DC Voltage alarm setting is higher than the Equalize voltage setting. See Sections 2.3.2 and 2.3.4.
	Defective rectifier bridge	2. Disconnect wire # 24 from terminal E3 of the rectifier assembly (near the left front of the enclosure). Restart the AT10.1. If You are able to measure output current, one of the SCRs is defective. Replace the rectifier assembly.
	3. Defective Main Control PC Board (A1)	3. Turn off both front panel circuit breakers. Turn on the dc breaker (CB2) <i>first</i> , followed by the ac breaker (CB1). If the AT10.1 output voltage is normal, but the HIGH DC VOLTAGE indicator is still on, replace the Main Control PC Board (A1).
No alarm, but output voltage is	1. Output current is below 2%	1. Output current must be greater than 2% of rated current to produce a High DC Voltage alarm. See <i>Parallel Operation</i> in Section 2.3.6.
above High DC Voltage setting	2. Defective Main Control PC Board (A1)	2. Turn off both front panel breakers. Turn on the dc breaker (CB2) <i>first</i> , followed by the ac breaker (CB1). If the AT10.1 output voltage is above the alarm setting, but the HIGH DC VOLTAGE indicator still does not light, replace the Main Control PC Board (A1).
VOLTAGE indicator is on, but ac & dc breakers	Battery is discharged	1. After an ac power failure, or a battery discharge for any other reason, it may take several hours to recharge the battery. It is normal for the LOW DC VOLTAGE indicator to be on until the battery voltage is above the Low DC Alarm voltage.
(CB1/CB2) are closed ac input voltage is normal, but	2. Low DC Voltage alarm and Float voltage settings are mismatched	2. Be sure that the Low DC Voltage alarm setting is lower than the Float voltage setting. See Sections 2.3.2 and 2.3.4.
there is output current	3. Defective rectifier bridge	3. Use a clamp-on ammeter to measure the current in wire # 11 or # 12. If it less than 70% of the dc output current, one of the SCRs or diodes is defective. Replace the rectifier assembly.
	4. Defective Main Control PC Board (A1)	4. Turn off both front panel circuit breakers. Restart by turning on the dc breaker (CB2) <i>first</i> , followed by the ac breaker (CB1). If the AT10.1 output voltage is normal, but the LOW DC VOLTAGE indicator is still on, replace the Main Control PC Board (A1).
	5. Defective dc breaker (CB2)	5. Disconnect the battery and connect a light dc load to the AT10.1. Measure the dc voltage from the input terminal to the output terminal of the circuit breaker, with the breaker on. It is normally no more than 50 millivolts. If it is near the rated output voltage, replace the breaker (CB2).

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
DC OUTPUT FAILURE indicator is on, but ac &	1. Defective rectifier bridge	 Use a clamp-on ammeter to measure the current in wire # or # 11. If it is less than 70% of the dc output current, one of the SCRs or diodes is defective. Replace the rectifier module.
dc breakers (CB1/CB2) are closed ac input voltage is	2. Defective Main Control PC Board (A1)	2. Turn off both front panel circuit breakers. Restart by turning on the dc breaker (CB2) <i>first</i> , followed by the ac breaker (CB1). If the AT10.1 output voltage and current are normal, but the DC OUTPUT FAILURE indicator is still on, replace the Main Control PC Board (A1).
normal	3. Defective Transformer (T1)	3. Use an ac voltmeter to measure the ac voltage from T1-X1 to X4. It is normally 50% to 80% higher than the rated dc output voltage. If it is too low, check the wiring of the primary taps. See Section 1.6 for details. If it is zero, replace T1.
	4. Defective dc breaker (CB2)	4. Disconnect the battery, and connect a light dc load to the AT10.1. Measure the dc voltage from the input terminal to the output terminal of the circuit breaker, with the breaker on. It is normally no more than 50 millivolts. If it is near the rated output voltage, replace the breaker.
AC INPUT FAILURE	1. AC power failure	1. If the ac input power fails, the front panel AC ON indicator goes out, and the AC INPUT FAILURE indicator goes on.
indicator is on	2. Upstream feed breaker/fuse is tripped	2. Be sure the front panel ac circuit breaker is closed. Measure the ac voltage at TB1-L1 and L2. If it is zero, check upstream distribution breakers and fuses.
	3. Defective wiring	3. Measure ac voltage at T1-H1 and T1-H5. It should be the same as the ac supply voltage.
	4. Defective Main Control PC Board (A1)	4. Turn off both front panel breakers. Restart by turning on the dc breaker (CB2) <i>first</i> , followed by the ac breaker (CB1). If the AC ON and AC INPUT FAILURE indicators are <i>both</i> still on, replace the Main Control PC Board (A1).

SYMPTOM	PROBABLE CAUSE	RECOMMENDED ACTION
POS GND or	1. Ground fault	1. Shut down and disconnect the AT10.1 from the battery and
NEG GND	on external dc	dc bus. Check the battery and dc bus for a ground fault. See
indicator is on	bus	Application Note (JD5032-00) for assistance.
	2. DC circuit breaker is open and POS GND indicator is on	2. If the AT10.1 has been placed into "standby" by opening the dc breaker (CB2), the ground detection circuit supplies an erroneous alarm. This is considered an <i>abnormal</i> condition for the AT10.1, and is not recommended. Close the dc breaker (CB2) and the alarm should end. To place the AT10.1 in "standby", open <i>both</i> front panel circuit breakers (CB1/CB2).
	3. Alarm needs calibration	3. Calibrate the AT10.1 ground detection sensitivity. See Section 2.3.4.
	4. Defective wiring	4. Disconnect the AT10.1 from the battery and dc bus. Turn the AT10.1 back on, and measure the voltage from TB1(+) to chassis, and from TB1(-) to chassis. The voltage readings should be equal, each approximately half of the total output voltage. If there is more than a 10% imbalance, turn off the AT10.1, and inspect all wiring from TB1(+/-) to the dc circuit breaker (CB2), and the rectifier bridge to the dc filter inductor (L1). Look for evidence of insulation damage, insufficient spacing between terminals and chassis, or wires run too close to metal edges.
	5. Defective Main Control PC Board (A1)	5. Turn off both front panel circuit breakers. Restart by turning on the dc breaker (CB2) <i>first</i> , followed by the ac breaker (CB1). If you are sure there is no ground fault on the external bus or within the AT10.1, but the POS GND or NEG GND indicator is still on, replace the Main Control PC Board (A1).
	6. Paralleled AT10.1(s) are shut down	6. Restart all other AT10.1s connected in parallel with unit that is experiencing ground fault. Otherwise, disconnect and lock out from the dc bus all shut down AT10.1s.
Summary alarm relay is in alarm mode, but no front panel alarm indicator is on	1. Defective Main Control PC Board (A1)	1. Turn off both front panel circuit breakers. Restart by turning on the dc breaker (CB2) <i>first</i> , followed by the ac breaker (CB1). If the relay remains in alarm mode, check the Low Level Detect indicator on Main Control PC Board (A1). See Section 2.3.8. If no other alarm is on, replace the Main Control PC Board (A1).

3.5. REPLACING DEFECTIVE COMPONENTS

⚠ WARNING

High voltages appear at several points inside the AT10.1. Use extreme caution when working inside the enclosure. Do not attempt to work inside the AT10.1 unless you are a qualified technician or electrician.

Disconnect and lock out all power from the AT10.1 before starting to remove or replace any components. Turn the ac power off at the distribution panel upstream from the charger. Disconnect the battery from the AT10.1 output terminals TB1(+/-).

NOTICE

While performing the following procedures, refer to the standard drawings in Appendix C for information on identifying internal components.

Removing the safety shield

Some of the repair procedures described below requires removal of the Plexiglas safety shield, mounted in front of the I/O panel. Unscrew the wing nuts and remove the washers to detach the shield. Do not lay the shield on the top of the AT10.1, The top vents are required for cooling.

⚠ CAUTION

Hazardous ac and dc voltages are present inside the AT10.1, on the I/O panel (TB1) terminals and certain internal components.

Removing the enclosure shroud

You may need to remove the enclosure shroud in order to make some internal measurements, and to replace or repair components. Turn off and remove all power to the AT10.1. Disconnect the battery from the output terminals (TB1+/-).

Remove the eleven (11) screws that hold the shroud on the rear and bottom of the enclosure, then the two screws on the left side that hold the rectifier heat sink assembly. Support the front panel and lift the shroud straight up to remove it. Be sure to save the plastic washers from the door hinge.

The heat sink assembly is supported from the rear panel. Avoid putting any mechanical stress on the heat sink.

Replacing the enclosure shroud

Lower the shroud onto the enclosure base. Install and tighten the eleven (11) screws that hold the shroud on the rear and bottom of the base before you install the two screws that support the heat sink assembly on the left side wall. Remember to reinstall the plastic washers on the door hinge.

Replacing the Main Control Printed Circuit Board (A1)

For details of this procedure, refer to *Service Instruction* (JD5012-00).

NOTICE

Printed circuit boards are sensitive to damage from static discharges. Leave replacement boards in their anti-static bags until you are ready to install them. Ground yourself before handling the board, by touching the ground stud on the back of the door. Always handle printed circuit boards by their edges.

Turn off and remove all power to the AT10.1. Disconnect the battery from the output terminals. Remove any optional user wiring from the various Main Control PCB (A1) terminals (e.g. TB3, TB8/J6, J3, etc.).

Remove the harness plug (J1) from the upper-left edge of the Main Control PC Board (A1), and unplug wire # 30 from the quick-connect terminal in the upper left corner of the board. The board is mounted on six (6) plastic standoffs. Compress the tab on each standoff, and pull the board toward you until it clears all standoffs.

Insert the replacement A1 board onto the instrument panel with the same orientation, and push it onto the standoffs. Make sure the board is fully seated on all six (6) standoffs. Reconnect the harness plug (J1) to the A1 board at the upper-left edge. Replace wire # 30 on the quick-connect terminal. Replace any user wiring to the various A1 terminals.

See Section 2.1 for steps to restart the AT10.1. If your parameters (float voltage, etc.) are different from the factory preset values, you should program in the new values now. See Section 2.3. You should also recalibrate the dc voltmeter according to Section 2.3.7.

Replacing the Rectifier Heat Sink Assembly (A6)

For details of this procedure, refer to *Service Instruction* (<u>JD5009-00</u>).

Turn off and remove all power to the AT10.1. Remove the Plexiglas safety shield. Disconnect the battery from the output terminals. Check with a voltmeter before proceeding. Remove the enclosure shroud as described in the previous section. Make sure the rectifier heat sink has cooled, and remove the entire assembly by the front edge. Remove all wires attached to the rectifier pc board(s) as you pull the assembly out. Hold the replacement Rectifier Assembly (A6) in front of the AT10.1 in the same orientation as the old. Reconnect all wires removed from the old rectifier as you insert it into the enclosure. To ensure correct replacement, refer to the standard drawings in Appendix C of this manual, or the service instruction supplied with the replacement assembly. Make sure all wires are connected to the proper terminals, and lugs are fully seated. If any lug does not fit snugly, disconnect it and carefully tighten the ears of the lug using long-nosed pliers. Then reconnect.

Rotate the rectifier assembly into position in the enclosure. Line up the metal tab with the mounting hole on the back panel of the AT10.1 and slide the assembly into position. Replace the shroud as described in the previous section. Tighten all screws and restart the AT10.1.

Replacing the optional dc filter assembly (A7)

The dc filter assembly consists of a diode heat sink, inductor L2, and one or two capacitors (C1x) installed on a single bracket.

Turn off and remove all power to the AT10.1. Remove the Plexiglas safety shield. Disconnect the battery from the output terminals TB1(+/-).

Find the flying lead from the inductor L2 (wire # 50) and disconnect the other end from the center terminal of inductor L1 (at the upper right corner of the rear panel). Disconnect wire # 15 from the quick-connect terminal at the top center of the diode heat sink, and remove wire # 54 from terminal E7 on the front circuit board on the rectifier assembly.

Carefully note which terminal the wire is connected to. Remove the four (4) screws at the top of the dc filter bracket. The bracket and the inductor will both fall forward, away from the rear panel.

Lift the filter bracket up about 0.25in / 6.4mm to release it from the clips at the bottom of the bracket. Swing the filter assembly outward to the left, rotating it so that the heat sink comes out first and the capacitor(s) last.

Install the replacement filter assembly by inserting the capacitor end first, and rotating the assembly inward so that the heat sink is last to go in. Push the bottom edge of the bracket into the clips in the rear panel, and install the four screws at the top of the bracket.

Connect wire # 15 to the quick-connect terminal at the top center of the diode heat sink. Route the flying lead from the inductor L2 (wire # 50) and connect it to the center terminal ("2") of the inductor L1. Reconnect wire # 54 to terminal E7 of the front circuit board on the rectifier assembly. Replace the shroud and the safety shield.

Replacing the ac input or dc output circuit breaker (CB1, CB2)

Turn off and remove all power to the AT10.1. Remove the Plexiglas safety shield. Disconnect the battery from the output terminals TB1(+/-).

Check with a voltmeter before proceeding. This includes remote sense wires if they were installed. Remove the two circuit breaker mounting screws on the front panel. Carefully rotate the circuit breaker upward and pull it out of the enclosure. Remove the wires from the terminals, one at a time, and transfer the wires to the terminals of the replacement breaker. Be sure the terminal screws are tight. Install the replacement breaker into the front panel, rotating it downward into place. Install the two mounting screws.

Replacing the main transformer (T1)

Turn off and remove all power to the AT10.1. Remove the Plexiglas safety shield. Disconnect the battery from the output terminals TB1(+/-).

Check with a voltmeter before proceeding. This includes remote sense wires if they were installed. Remove the enclosure shroud and the safety shield. Disconnect the harness wires # 28 and # 29 from the upper row of transformer terminals. Disconnect wires # 11 and # 12 from the top of the rectifier heat sink. Disconnect harness wires # 3 and # 4 from the lower row of terminals. Leave both jumpers in place on the lower row.

Remove the four screws or nuts that secure the transformer to the rear panel. Support the transformer by the top of the core and lift it up to get the bottom bracket off the rear panel. Remove the transformer from the enclosure.

Check the jumpers on the bottom row of terminals of the replacement transformer. Make sure they are connected to the same terminals as the jumpers on the transformer you just removed from the AT10.1. For details see Section 1.6, *Changing the Transformer Taps*.

Hold the replacement transformer with the terminals labeled H1 through H5 at the bottom, facing you. Place the transformer against the rear panel, and slide the bottom of the transformer bracket into the slots on the rear panel. Install the four screws or nuts onto the mounting bracket of the transformer. Rewire the transformer, following the steps above in reverse. Refer to Section 1.6, and verify that the transformer is properly connected for your input voltage.

Replacing the ac surge suppressors (VR2, VR4 or VR5)

Turn off and remove all power to the AT10.1. Remove the Plexiglas safety shield. Disconnect the battery from the output terminals TB1(+/-).

For **VR2**, remove the hardware from the input terminal L1, and remove the lead of the ac surge suppressor. Install one lead of the replacement surge suppressor onto the L1 terminal. Replace the other wires and the hardware. Repeat procedure for the L2 terminal. Tighten all hardware.

For **VR4**, remove the hardware from the input terminal L1, and remove the lead of the ac surge suppressor. Install one lead of the replacement surge suppressor onto the L1 terminal. Replace the other wires and the hardware. Repeat procedure for the *left* ground stud. Tighten all hardware.

For **VR5**, repeat procedure for the ac surge suppressor connected to the L2 terminal and the *right* ground terminal. Tighten all hardware.

NOTICE The ac surge suppressors are not polarized.

Replacing the dc surge suppressor (VR1)

Turn off and remove all power to the AT10.1. Remove the Plexiglas safety shield. Disconnect the battery from the output terminals TB1(+/-).

Remove the hardware from the output terminal TB1(+), and remove the lead of the dc surge suppressor. Install one lead of the replacement surge suppressor. Replace the other wires and the hardware. Repeat for the output terminal TB1(-). Tighten all hardware.

NOTICE The dc surge suppressor is not polarized.

Replacing the dc EMI filter networks (VR6/C4, VR7/C5)

Replace these networks as assemblies. Do not replace individual parts.

Turn off and remove all power to the AT10.1. Remove the Plexiglas safety shield. Disconnect the battery from the output terminals TB1(+/-).

To replace the network VR6/C4, remove the hardware from the output terminal TB1(-), and remove the lead of the network. Cut the plastic wire ties holding the assembly tight against the I/O panel. Install one lead of the replacement network. Replace the other wires and the hardware. Repeat for the other lead of the network on the ground terminal. For the VR7/C5 network, use the above procedure, but start with the lead on TB1(+). Tighten all hardware. Replace cut wire ties if possible.

NOTICE The dc EMI filter networks are not polarized.

Replacing the power supply ballast resistor (R3)

Shut down and remove all power to the AT10.1. Remove the Plexiglas safety shield. Disconnect the battery from the output terminals TB1(+/-).

Locate the power supply ballast resistor (R3) near the I/O panel (TB1). In 12 & 24 Vdc units, R3 is installed at the top right corner, connected to E17 and TB1(+). In 48 & 130 Vdc units, R3 is mounted on the bracket behind the I/O panel. In 130 Vdc 6Adc units, R3 is comprised of an assembly of two (2) resistors connected in series, mounted to the bracket.

Disconnect the lead of R3 connected to TB1(+) and replace it with the corresponding lead of the replacement power resistor. Remove the other lead of R3 from terminal E17 on the I/O panel and replace it with the remaining lead of the replacement power resistor. Tighten all hardware.

In 12 & 24 Vdc units, tuck the new R3 resistor behind the I/O panel so that leads are properly spaced. In 48 & 130 Vdc units, remove the screws that mount the old R3 resistor(s) to the bracket, and replace with the new resistor(s). Tighten all mounting hardware and restart the AT10.1.

For further information, refer to Service Instruction (JD5010-00).

Replacing the positive scaling resistor (R4)

Locate the scaling resistor (R4) mounted to TB5 on the back of the front panel, just above the Main Control PC Board (A1). The resistor (R4 is the one on the left) is mounted on two quick-connect terminals. Remove the resistor by grasping the terminals by the plastic insulation, and pulling out and downward. Install the replacement resistor by pushing the terminals firmly onto the quick-connect blades on the terminal block (TB5).

Replacing the voltage crowbar resistor (R6)

Locate the resistor (R6) mounted to TB5 on the back of the front panel, just above the Main Control PC Board (A1). The resistor (R6 is the one on the right) is mounted on two quick-connect terminals. Remove the resistor by grasping the terminals by the plastic insulation, and pulling out and downward. Install the replacement resistor by pushing the terminals firmly onto the quick-connect blades on the terminal block (TB5).

Replacing the negative scaling resistor (R14)

Turn off and remove all power to the AT10.1. Remove the Plexiglas safety shield. Disconnect the battery from the output terminals TB1(+/-).

The scaling resistor R14 is connected to TB(-) with a ring lug. The other lead of the resistor is soldered to wire # 20.

Remove the insulating sleeving from the soldered joint to wire # 20 (you may have to remove a harness tie) and cut the resistor lead near the solder joint. Disconnect the lugged-end of R14 from TB1(-) and discard the old resistor.

Using a soldering iron no larger than 35 Watts, solder the bare lead of the new **R14** to wire # **20**. Insulate the joint with plastic electrical tape. Crimp a similar ring lug to the other lead of the new resistor. Connect the lugged end of the new scaling resistor **R14** to TB1(-).

3.6. ORDERING REPLACEMENT PARTS

All AT10.1 Series battery chargers ship with a supplemental **Parts Data Package** report, itemizing all components within the unit. Contact your sales representative to place an order for spare or replacement parts.

Please provide the following information for each component:

- Model number and serial number of your AT10.1 Series battery charger
- Reference Designator, factory part number and description
- Quantity required

NOTICE

Some of the factory part numbers listed on the **Parts Data Package** report may differ from the standard replacement part numbers listed in this manual. Custom parts may have replaced standard parts to satisfy your specification. In that case, you should order the part number(s) listed on the report.

The following table may specify part replacement **kits** that include other materials, such as installation instructions and packaging materials. You may order spare parts using either the report part number or listed kit. The factory may make necessary adjustments to your order to ensure proper delivery of a complete kit.

Refer to the table below for the most common items.

Table 3-1: REPLACEMENT PARTS

Reference	Description		Factory Pa	rt Number		Rec.
Designator	Description	12 Vdc	24 Vdc	48 Vdc	130 Vdc	Spare
A1	Main Control PC Board (EN5002-00)	EJ1243-10				Υ
А3	Rectifier Gate Driver PC Board (EN5011-00)		EJ50	93-00		
A5	Auxiliary Relay PC Board (EN0027-00)		EJ12	43-03		Υ
A6	Rectifier / Heat Sink assembly (A3 + A16)		EJ12	43-00		Υ
A7	DC Output Filter assembly		See Ta	ble 3-2		
A8	Battery Eliminator Filter assembly (requires filtered AT10.1) 12-25Adc		EJ1155-00		EJ1155-01	
A10			Caa Ammand	:D T-bl- 0	EJ1155-02	
A10 A16	Temperature Compensation Probe assembly		See Append		:	
	Rectifier SCR Module	EJ5094-00		DD0040.00	.,	
C1	DC Output Filter Capacitor		RP0019-09		RP0019-08	Y
C2	Battery Eliminator Filter Capacitor	RP0019-09 RP0019-08			Y	
C4	EMI Filter Capacitor		See V			
C5	EMI Filter Capacitor		See V	R7/C5		
CB1	AC Breaker (standard) 120/208/240 Vac	See Table 3-3				
CB1	AC Breaker (medium AIC) 120/208/240 Vac	See Table 3-4				
CB1	AC Breaker (high AIC) 120/208/240 Vac	See Table 3-5				
CB1	AC Circuit Breaker (medium AIC) 480 Vac	RE0171-00				
CB1	AC Circuit Breaker (high AIC) 480 Vac	RE0043-00				
CB2	DC Circuit Breaker (standard)	See Table 3-6				
CB2	DC Circuit Breaker (medium AIC)	See Table 3-7				
CB2	DC Circuit Breaker (high AIC)	See Table 3-8				
CR1	Polarity Diode		EJ12	43-04		Υ
CR2	Blocking Diode		EJ124	43-05		_

Reference	Decembries		Factory Pa	art Number		Rec.
Designator	Description	12 Vdc	24 Vdc	48 Vdc	130 Vdc	Spare
F1	480 Vac M/H AIC AC Input Fuse	See Table 3-14				Υ
L1	Main Inductor		See Ta	ıble 3-9		
L2	DC Filter Inductor		See Ta	ble 3-13		
P5	Jumper for disabling Ground Detection circuit		RC01	00-00		
P7	Jumper for voltage selection on A5 pc board		RC01	00-00		
P9	Jumper for front panel lockout feature on A1		RC01	00-00		
R2	Rating resistor		See Ta	ble 3-10		
R3	Power Supply (Ballast) Resistor	EJ1127-00 12Ω 2W	EJ1127-01 68Ω 11W	EJ1127-02 150Ω 50W	EJ1127-03/23 (Note 1)	Y
R4	Scaling resistor (positive side)	EJ1134-00 3160 Ω	EJ1134-01 6980 Ω	EJ1134-02 14.0 kΩ	EJ1134-03 38.3 kΩ	
R6	Voltage crowbar resistor	EJ1135-00	EJ1135-01	EJ1135-02	EJ1135-03	
R9	Filter capacitor (C1) bleed resistor	EJ1137-00	EJ1137-00	EJ1137-01	EJ1137-02	
R14	Scaling resistor (negative side)	EJ1222-00 3160 Ω	EJ1222-01 6980 Ω	EJ1222-02 14.0 kΩ	EJ1222-03 38.3 kΩ	
T1	Main transformer (120/208/240 Vac)		See Ta	ble 3-11		
T1	Main transformer (480 Vac)		See Ta	ble 3-12		
TB1-x	I/O terminal box lug for #14-6 AWG		RC00	56-04		
VR1	Output Surge Suppressor		EJ11	32-01		Υ
VR2	Input Surge Suppressor (120/208/240 Vac)		EJ11	32-01		Υ
VR2	Input Surge Suppressor (480 Vac)		EJ11	32-02		Υ
VR3	Input Lightning Arrestor	EJ1074-00				
VR4/5	Input Surge Suppressor (120/208/240 Vac)		EJ11	32-01		Υ
VR4/5	Input Surge Suppressor (480 Vac)		EJ11	32-02		Υ
VR6/C4	DC EMI Filter Network		EJ50	21-01		
VR7/C5	DC EMI Filter Network		EJ50	21-01		

Note 1: In 130 Vdc AT10.1 Group I units, two (2) different Power Supply (Ballast) Resistor assemblies (R3) are used, mounted behind the I/O panel (TB1):

- a) 12-25 Adc EJ1127-03 consists of one (1) 500 $\!\Omega$ 100W resistor
- o) 6 Adc **EJ1127-23** consists of two (2) 250Ω 50W resistors connected in series

Note 2: Listed part numbers subject to change without notice. Refer to data listed in AT10.1 Parts Data Package report.

Table 3-2: DC FILTER ASSEMBLIES (L2/C1/R9/CR1/CR2)

Current Rating	12 Vdc	24 Vdc	48 Vdc	130 Vdc
6A	EJ1072-00	EJ1072-00	EJ1072-02	EJ1072-03
12A	EJ1072-00	EJ1072-00	EJ1072-02	EJ1072-06
16A	EJ1072-01	EJ1072-01	EJ1072-07	EJ1072-04
20A	EJ1072-01	EJ1072-01	EJ1072-07	EJ1072-04
25A	EJ1072-01	EJ1072-01	EJ1072-07	EJ1072-05

Table 3-3: STANDARD AC CIRCUIT BREAKERS (CB1) - 120/208/240 Vac

Current Rating	12 Vdc	24 Vdc	48 Vdc	130 Vdc
6A	RE0159-11	RE0159-11	RE0159-11	RE0159-13
12A	RE0159-11	RE0159-11	RE0159-13	RE0159-16
16A	RE0159-11	RE0159-12	RE0159-13	RE0159-19
20A	RE0159-11	RE0159-12	RE0159-14	RE0159-20
25A	RE0159-11	RE0159-12	RE0159-15	RE0159-20

Table 3-4: MEDIUM INTERRUPTING CAPACITY AC BREAKERS (CB1) - 120/208/240 Vac

Current Rating	12 Vdc	24 Vdc	48 Vdc	130 Vdc
6A	RE0171-00	RE0171-00	RE0171-00	RE0171-01
12A	RE0171-00	RE0171-00	RE0171-01	RE0171-04
16A	RE0171-00	RE0171-00	RE0171-01	RE0171-07
20A	RE0171-00	RE0171-00	RE0171-02	RE0171-08
25A	RE0171-00	RE0171-00	RE0171-03	RE0171-08

Table 3-5: HIGH INTERRUPTING CAPACITY AC BREAKERS (CB1) - 120/208/240 Vac

Current Rating	12 Vdc	24 Vdc	48 Vdc	130 Vdc
6A	RE0043-00	RE0043-00	RE0043-00	RE0043-01
12A	RE0043-00	RE0043-00	RE0043-01	RE0043-04
16A	RE0043-00	RE0043-00	RE0043-01	RE0043-07
20A	RE0043-00	RE0043-00	RE0043-02	RE0043-08
25A	RE0043-00	RE0043-00	RE0043-03	RE0043-08

Table 3-6: STANDARD DC CIRCUIT BREAKERS (CB2)

Current Rating	12 Vdc	24 Vdc	48 Vdc	130 Vdc
6A	RE0159-01	RE0159-01	RE0159-01	RE0159-12
12A	RE0159-02	RE0159-02	RE0159-02	RE0159-13
16A	RE0159-03	RE0159-03	RE0159-03	RE0159-14
20A	RE0159-04	RE0159-04	RE0159-04	RE0159-15
25A	RE0159-06	RE0159-06	RE0159-06	RE0159-17

Table 3-7: MEDIUM AMPERE INTERRUPTING CAPACITY DC CIRCUIT BREAKERS (CB2)

Current Rating	12 Vdc	24 Vdc	48 Vdc	130 Vdc
6A	RE0171-00	RE0171-00	RE0171-00	RE0171-00
12A	RE0171-01	RE0171-01	RE0171-01	RE0171-01
16A	RE0171-02	RE0171-02	RE0171-02	RE0171-02
20A	RE0171-03	RE0171-03	RE0171-03	RE0171-03
25A	RE0171-04	RE0171-04	RE0171-04	RE0171-04

Table 3-8: HIGH AMPERE INTERRUPTING CAPACITY DC CIRCUIT BREAKERS (CB2)

Current Rating	12 Vdc	24 Vdc	48 Vdc	130 Vdc
6A	RE0043-00	RE0043-00	RE0043-00	RE0043-00
12A	RE0043-01	RE0043-01	RE0043-01	RE0043-01
16A	RE0043-02	RE0043-02	RE0043-02	RE0043-02
20A	RE0043-03	RE0043-03	RE0043-03	RE0043-03
25A	RE0043-04	RE0043-04	RE0043-04	RE0043-04

Table 3-9: MAIN INDUCTOR (L1)

Current Rating	12 Vdc	24 Vdc	48 Vdc	130 Vdc
6A	AP0928-00	AP0928-00	AP0928-00	AP1122-00
12A	AP0928-00	AP0928-00	AP0928-00	AP0930-00
16A	AP0926-00	AP0926-00	AP0926-00	AP0931-00
20A	AP0926-00	AP0926-00	AP0926-00	AP0931-00
25A	AP0926-00	AP0926-00	AP0926-00	AP0931-00

NOTE: Listed part numbers subject to change without notice. Refer to data listed in AT10.1 Parts Data Package report.

Table 3-10: RATING RESISTOR (R2)

Current Rating	12 Vdc	24 Vdc	48 Vdc	130 Vdc
6A	EJ1133-00	EJ1133-05	EJ1133-10	EJ1133-15
	34.8 kΩ	13.0 kΩ	5.11 kΩ	1.50 kΩ
12A	EJ1133-01	EJ1133-06	EJ1133-11	EJ1133-16
	40.2 kΩ	15.4 kΩ	6.19 kΩ	2.21 kΩ
16A	EJ1133-02	EJ1133-07	EJ1133-12	EJ1133-17
	53.6 kΩ	19.6 kΩ	7.50 kΩ	2.74 kΩ
20A	EJ1133-03	EJ1133-08	EJ1133-13	EJ1133-18
	78.7 kΩ	23.7 kΩ	9.09 kΩ	3.57 kΩ
25A	EJ1133-04	EJ1133-09	EJ1133-14	EJ1133-19
	118 kΩ	29.4 kΩ	11.0 kΩ	4.32 kΩ
Connector terminal extraction tool	Molex Part No. 11-03-0044			

Table 3-11: MAIN TRANSFORMER (T1) - 120/208/240 Vac

Current Rating	12 Vdc	24 Vdc	48 Vdc	130 Vdc
6A	AA0718-00	AA0719-00	AB2023-00	AB1868-00
12A	AA0718-00	AA0719-00	AB2023-00	AB1857-00
16A	AA0720-00	AB1855-00	AB1856-00	AB1858-00
20A	AA0720-00	AB1855-00	AB1856-00	AB1858-00
25A	AA0720-00	AB1855-00	AB1856-00	AB1858-00

Table 3-12: MAIN TRANSFORMER (T1) - 480 Vac

Current Rating	12 Vdc	24 Vdc	48 Vdc	130 Vdc
6A	AA0733-00	AA0734-00	AB2038-00	AB2039-00
12A	AA0733-00	AA0734-00	AB2038-00	AB2032-00
16A	AA0735-00	AB2035-00	AB2036-00	AB2037-00
20A	AA0735-00	AB2035-00	AB2036-00	AB2037-00
25A	AA0735-00	AB2035-00	AB2036-00	AB2037-00

Table 3-13: FILTER INDUCTOR (L2)

Current Rating	12 Vdc	24 Vdc	48 Vdc	130 Vdc
6A	AP0928-00	AP0928-00	AP0928-00	AP1081-00
12A	AP0928-00	AP0928-00	AP0928-00	AP0928-00
16A	AP0927-00	AP0927-00	AP0926-00	AP0926-00
20A	AP0927-00	AP0927-00	AP0926-00	AP0926-00
25A	AP0927-00	AP0927-00	AP0926-00	AP0926-00

Table 3-14: 480 Vac INPUT FUSE (F1)

Current Rating	12 Vdc	24 Vdc	48 Vdc	130 Vdc
6A	RE0008-00	RE0008-00	RE0008-02	RE0008-06
12A	RE0008-00	RE0008-02	RE0008-06	RE0008-08
16A	RE0008-02	RE0008-06	RE0008-08	RE0008-09
20A	RE0008-02	RE0008-06	RE0008-08	RE0008-11
25A	RE0008-02	RE0008-06	RE0008-08	RE0008-11

NOTE: Listed part numbers subject to change without notice. Refer to data listed in AT10.1 Parts Data Package report.

SPECIFICATIONS

Except as noted, all specifications apply at: 77° F / 25° C, nominal ac line voltage & nominal float voltage

Specification	Conditions	12 Vdc	24 Vdc	48 Vdc	130 Vdc
Output voltage regulation	Vac +10%, -12% 0 to 100% load Temp. 32-122° F / 0-50° C Freq. 60 ± 3 Hz	$\pm0.25\%$ (see product literature for specific da		ific data)	
Transient response	20-100% load change, with battery connected	output voltage change \pm 4% maximur recovery to \pm 2.0% in 200 ms recovery to \pm 0.5% in 500 ms			ms
Efficiency	12 Adc rating, full load (%)	67.00	72.00	78.00	85.00
Linciency	25 Adc rating, full load (%)	73.00	77.00	85.00	91.00
	Unfiltered (with battery)	1	% rms (typ	.) terminals	2% rms
Output ripple voltage	Filtered (with battery)	30	mV rms (ma	ax.) terminals	100 mV
(per NEMA PE5-1996)	Filtered (without battery)	1	% rms (typ	.)	2% rms
	Battery Eliminator Filter Option (without battery)	30 mV rms 10		100 mV	
Current Limit	adjustable	50-110 % of rated output current		urrent	
Soft start	0 to 100% load	4 seconds			
	Float (Vdc)	11.0-14.5	22.0-29.5	44.0-58.0	110-141
Voltage adjustment ranges	Equalize (Vdc)	11.7-16.0	23.4-32.0	46.8-61.0	117-149
voltage adjustifierit ranges	High DC Voltage alarm (Vdc)	12-19	24-38	48-76	120-175
	Low DC Voltage alarm (Vdc)	7-14.5	15-29.5	30-58	80-141
Voltmeter range (Vdc)		0 - 21	0 - 42	0 - 75	0 - 195
Ammeter range (Adc)	all ratings		0 -	30	
Surge withstand capability	test per ANSI C37.90.1-1989	no erroneous outputs			
Reverse current from battery	ac input power failure	90 mA maximum			
Audible noise	average for four (4) sides, 5ft / 1.5m from enclosure	less than 65 dBA			
Cooling		natural convection			
Ambient temperature	operating	32-122° F / 0-50° C			
Elevation		3000ft / 1000m without de-rating			ating
Relative humidity		0 to 95% non-condensing			ng
Alarm relay contact rating	120 Vac / 125 Vdc	0.5 A resistive			

FIELD INSTALLABLE ACCESSORIES AND OPTIONS

All options and accessories listed below are available in kits for field installation. Kits contain all parts and hardware with detailed installation instructions. To order accessories/options, please provide the following information for each kit:

- Model number, enclosure style, and serial number of your AT10.1
- Factory part number and description, from the table below
- Quantity required

Contact your sales representative to place an order for options & accessories.

Description	Kit Part Number
standard DC Output Filtering (per NEMA PE5-1996)	see table 3-2
Battery Eliminator Filtering (per NEMA PE5-1996)	see table 3-1
Auxiliary Alarm Relay PC Board (A5) for standard circuit breakers	EI0213-00
Auxiliary Alarm Relay PC Board (A5) for med/high AIC circuit breakers	EI0213-01
Copper Ground Bus with one (1) box lug for #14-6 AWG	EI0195-00
AC Input Lightning Arrestor (VR3) option	EJ1074-00
Floor-Mounting Kit for Style-586/594 Enclosure	EI0192-00
Relay Rack-Mounting Kit for Style-586/594 Enclosure	EI0193-00
NEMA-2 Type Drip Shield for Style-586/594 Enclosure	EI0191-00
NEMA-4 (12/13) Type Cabinet for Style-586/594 Enclosure	EI0214-0#
Cabinet Heater Assembly for Style-586/594 Enclosure	EJ1223-00
Padlock for Style-586/594 Enclosure Front Panel Door	EI0215-00
Remote Temperature Compensation Probe Assembly (A10)	see below
DNP3 Level 2 / Modbus Communications Module	see Appendix E
Forced Load Sharing Accessory	EJ5126-##

Remote Temperature Compensation Probe

The temperature compensation accessory consists of two (2) components:

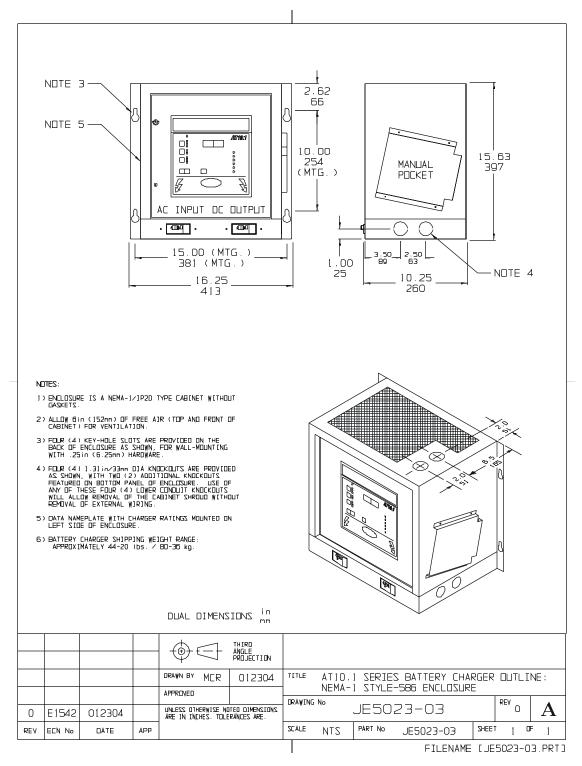
- 1. To order a replacement probe (or puck), request part number EJ5032-00. This probe (A10) is good for all AT10.1 output voltages and all battery types.
- 2. The standard temperature compensation assembly is supplied with a 25ft / 7.6m interconnection cable. If you need a longer cable, order it from the table below, which also lists the ordering part number for a complete accessory.

Temperature Compensation Probe Kits

Cable Length (feet / m)	Kit Part Number (includes probe)	Replacement Cable Part Number
25 / 7.6	EJ5033-00	EJ5011-00
50 / 15.2	EJ5033-01	EJ5011-01
100 / 30.5	EJ5033-02	EJ5011-02
200 / 61.0	EJ5033-03	EJ5011-03

Use a single cable assembly. Do not try to splice cables together to increase the length.

Outline: AT10.1 Group I Battery Charger NEMA-1 Style-586 Enclosure (JE5023-03)



http://www.ATSeries.net/PDFs/JE5023-03.pdf

Drip Shield

WW

DD

HH

W

D

18.75

12.50

26.50

16.25

10.00

476

337

729

495

324

Optional Enclosure Dimensions: AT10.1 Group I Battery Charger w/Penthouse and Drip Shield - Style-586 Enclosure

DIMENSION in mm Standard WW 16.25 495 12.50 DD 324 HH15.63 457 1.01TA 1885-T2 W 16.25 495 10.75 337 D DD with PENTHOUSE Penthouse OPTIONAL PENTHOUSE \circ 0 WW 14.00 356 00 DD 10.75 337 НН HH 22.63 572 1.01TA 682-T2 W 16.25 495 10.00 324 with Drip Shield DRIP SHIELD WW 18.75 559 DD 12.50 318 НН HH19.50 552 1.01TA 27-586 W 16.25 495 337 D 10.75 - DD with Penthouse & DRIP SHIELD

PENTHOLISE

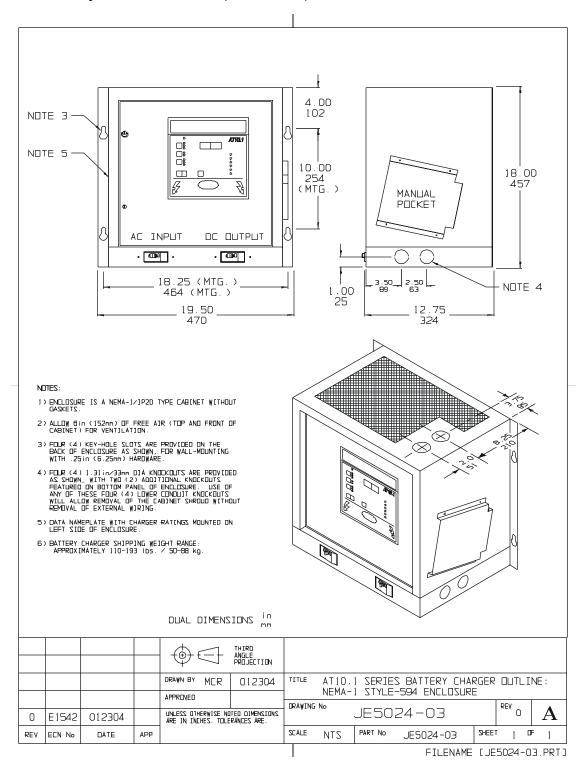
OPTIONAL PENTHOUSE

1.01TA 1885-T2 00

- D

нн

Outline: AT10.1 Group I Battery Charger NEMA-1 Style-594 Enclosure (JE5024-03)

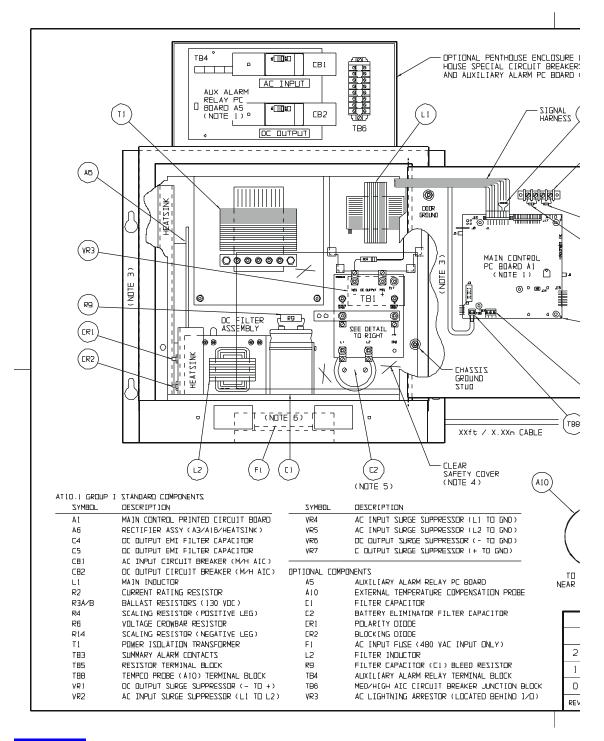


http://www.ATSeries.net/PDFs/JE5024-03.pdf

Optional Enclosure Dimensions: AT10.1 Group I Battery Charger w/Penthouse and Drip Shield - Style-594 Enclosure

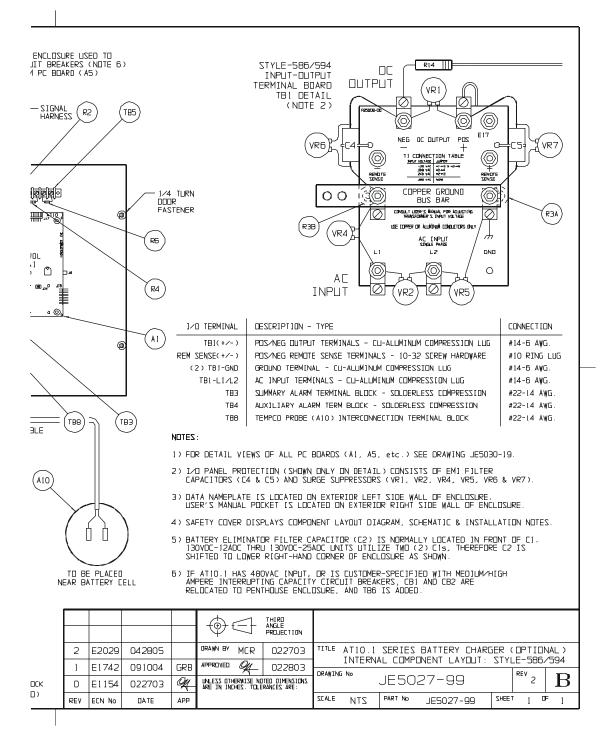
DIMENSION in mm Standard VENT WW 19.50 495 6 DD 12.75 324 HH18.00 457 W 19.50 495 D 13.25 337 PENTHOUSE with Penthouse DAMITTAN BZUDHTMB9 0 0 WW 14.00 356 DD 13.25 337 HH25.00 635 AT10.1 ST-594 W 19.50 495 12.75 324 D with ORIP SHIELD Drip Shield DRIP ZHIELD WW 22.00 559 DD 12.50 318 AT10.1 ST-594 HH 21.75 552 W 19.50 495 13.25 D 337 - D with DRIP ZHIELD Penthouse & OPTIONAL PENTHOUSE Drip Shield PENTHOLISE 0 \bigcirc WW18.75 476 DD 13.25 337 AT10.1 ST-594 HH28.75 729 W 19.50 495 D 12.75 324 - D

Internal Component Layout: AT10.1 Group I Battery Charger Style-586/594 Enclosure w/Common Options (**JE5027-99**)



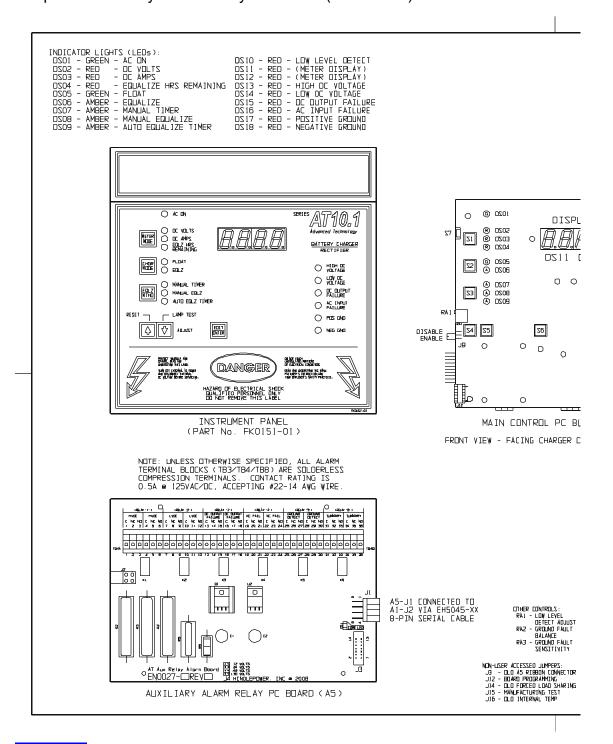
NOTICE This internal component layout drawing (**JE5027-99**) depicts an AT10.1 Series battery charger housed in a Style-586 or Style-594 enclosure, with ALL available options. Standard components (A1 through VR7) are supplied in all such units. Optional components (A5 through VR3) are supplied only in those AT10.1s configured with such options.

Internal Component Layout: AT10.1 Group I Battery Charger Style-596/594 Enclosure w/Common Options (JE5027-99)



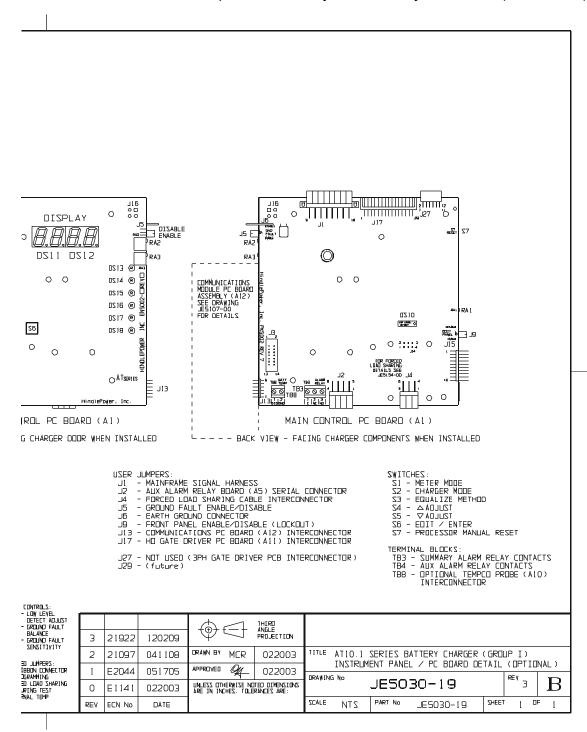
http://www.ATSeries.net/PDFs/JE5027-99.pdf

Instrument Panel / PC Board Detail: AT10.1 Group I Battery Charger w/Optional Auxiliary Alarm Relay PC Board (**JE5030-19**)



NOTICE This instrument panel drawing (**JE5030-19**) depicts the optional Auxiliary Alarm Relay PC Board (A5), which provides two (2) sets of individual form-c contacts (TB4) for all alarm conditions. Standard AT10.1s feature one (1) set of form-c summary (common) alarm contacts (TB3).

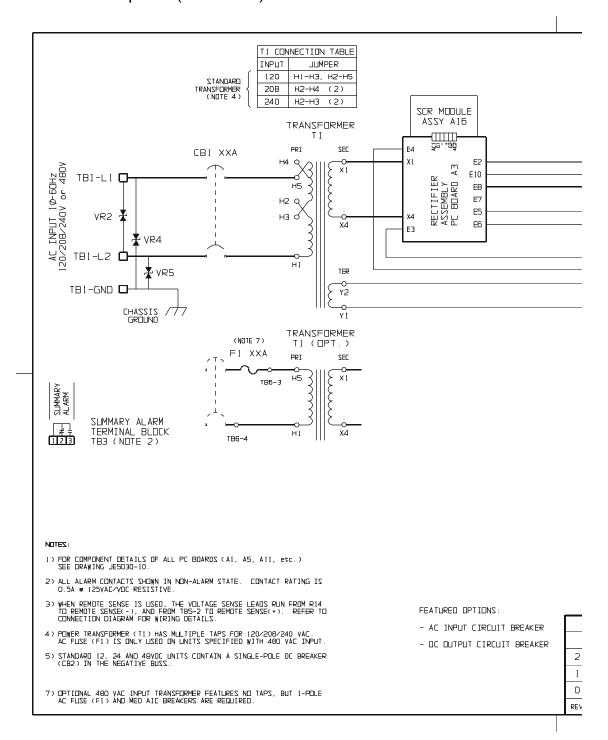
Instrument Panel / PC Board Detail: AT10.1 Group I Battery Charger w/Optional Auxiliary Alarm Relay PC Board (JE5030-19)



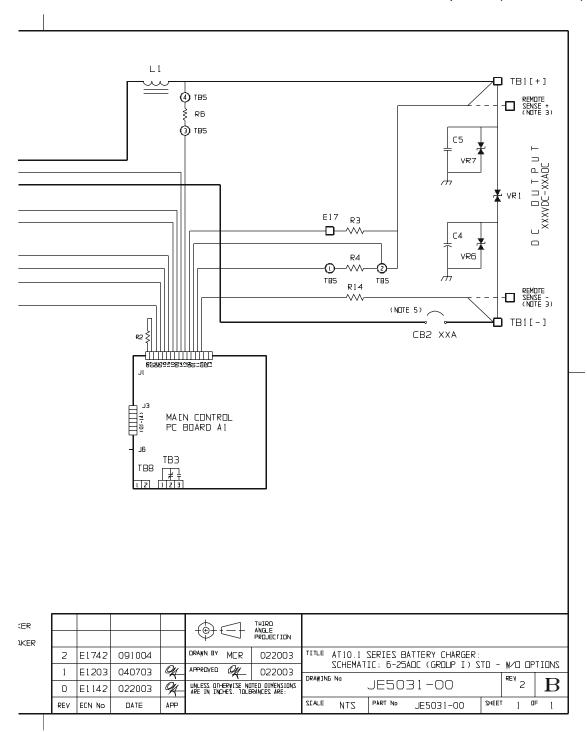
http://www.ATSeries.net/PDFs/JE5030-19.pdf

APPENDIX C (Standard Drawings)

Schematic: AT10.1 Group I Battery Charger Standard w/o Options (**JE5031-00**)

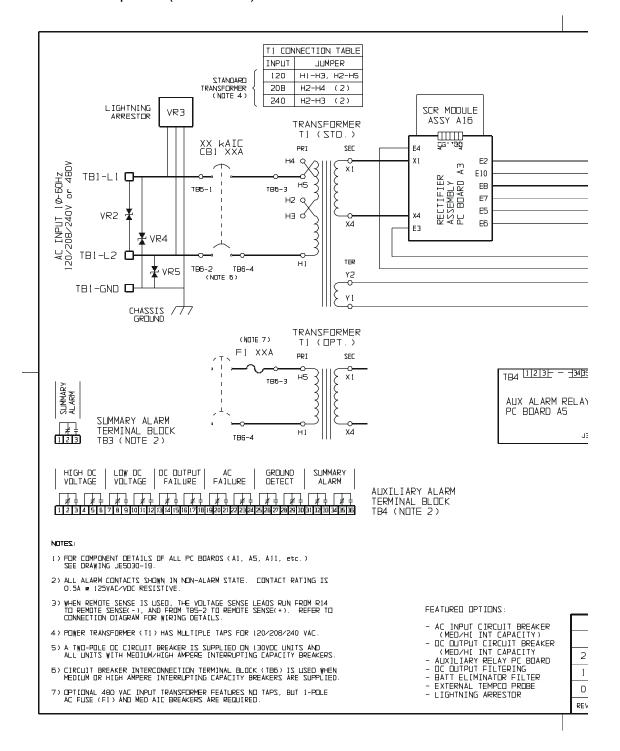


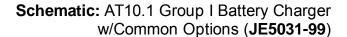
Schematic: AT10.1 Group I Battery Charger Standard w/o Options (JE5031-00)

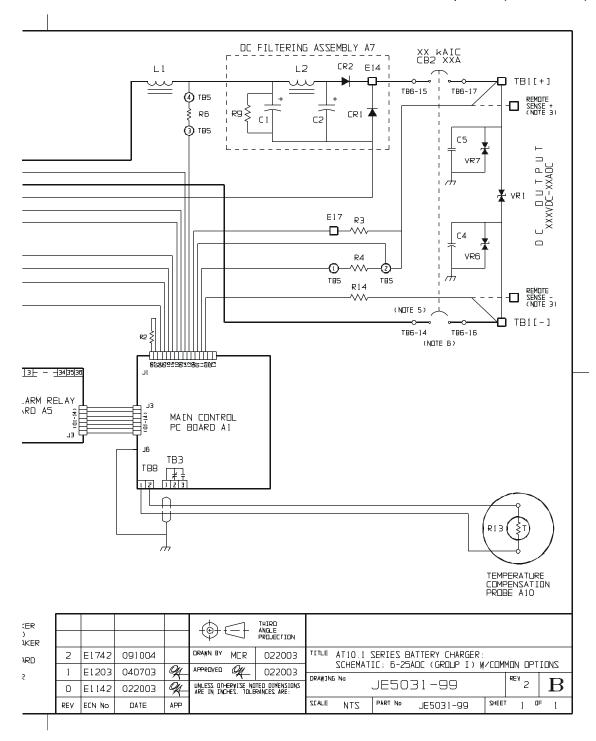


http://www.ATSeries.net/PDFs/JE5031-00.pdf

Schematic: AT10.1 Group I Battery Charger w/Common Options (**JE5031-99**)



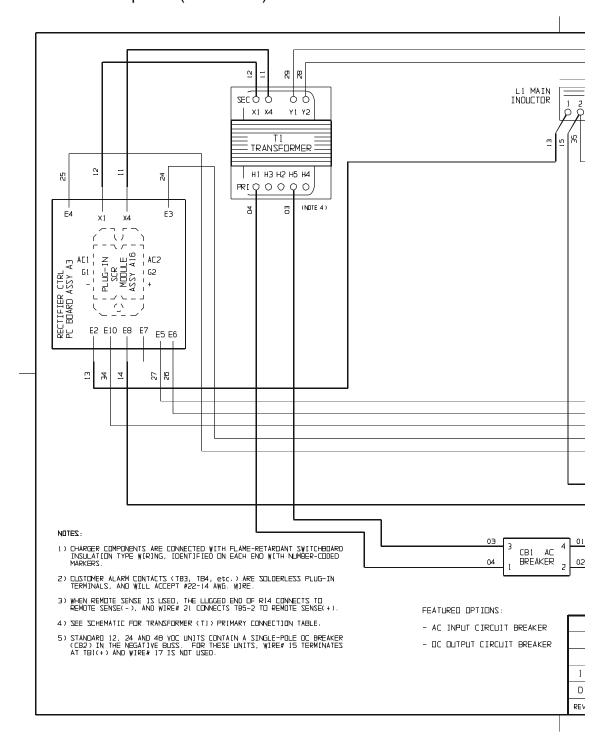




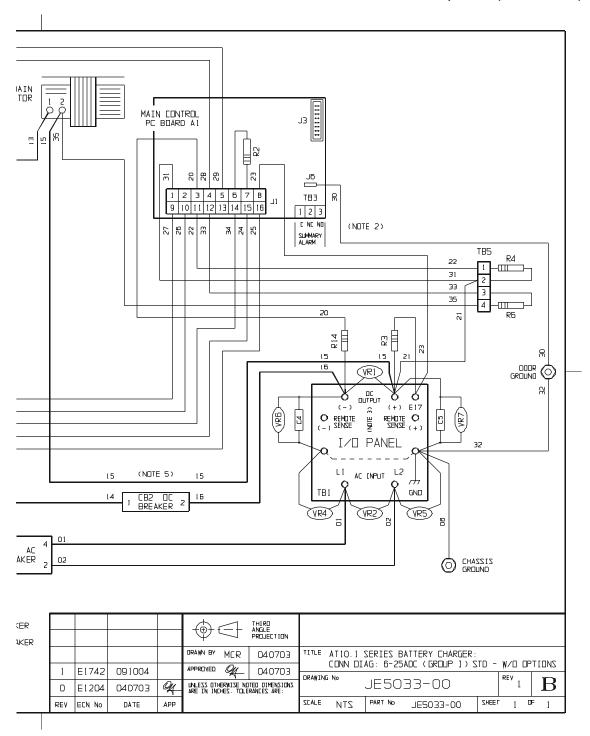
http://www.ATSeries.net/PDFs/JE5031-99.pdf

APPENDIX C (Standard Drawings)

Connection Diagram: AT10.1 Group I Battery Charger Standard w/o Options (**JE5033-00**)



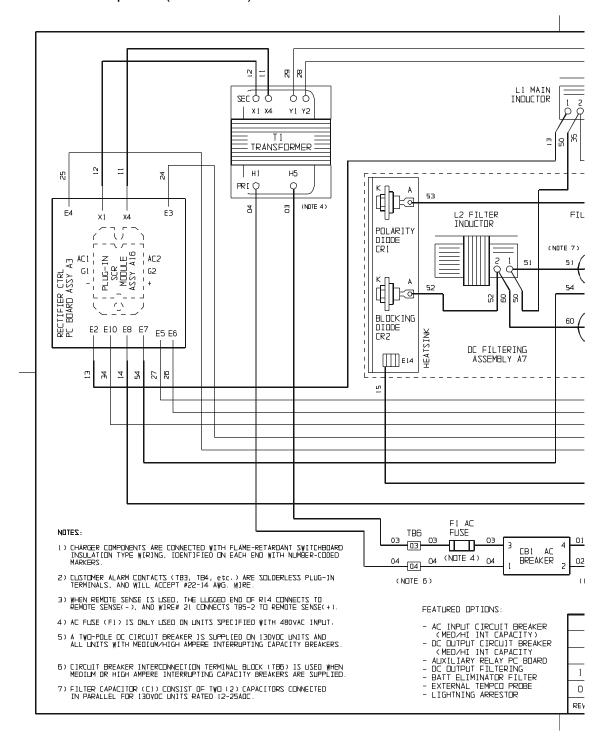
Connection Diagram: AT10.1 Group I Battery Charger Standard w/o Options (JE5033-00)



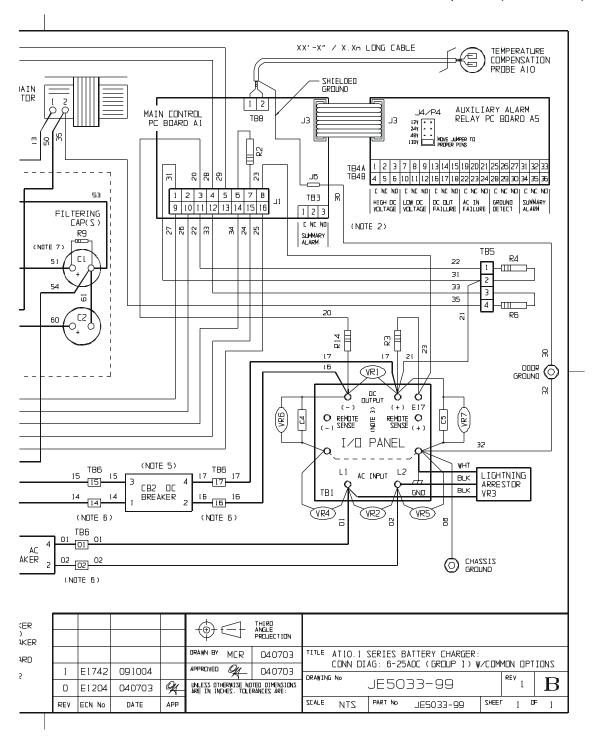
http://www.ATSeries.net/PDFs/JE5033-00.pdf

APPENDIX C (Standard Drawings)

Connection Diagram: AT10.1 Group I Battery Charger w/Common Options (**JE5033-99**)



Connection Diagram: AT10.1 Group I Battery Charger w/Common Options (**JE5033-99**)



http://www.ATSeries.net/PDFs/JE5033-99.pdf

RECOMMENDED FLOAT AND EQUALIZE VOLTAGES

This table contains suggested values for commonly used batteries. Consult your battery manufacturer's documentation for specific values and settings for your battery type.

Battery Cell Type		Recommended Float Voltage/cell	Recommended Equalize Voltage/cell
(0	Antimony (1.215 Sp. Gr.)	2.17	2.33
Types	Antimony (1.250 Sp. Gr.)	2.20	2.33
(/		2.23	2.33 - 2.40
Calcium (1.215 Sp. Gr.)		2.25	2.33
ead-Acid	Calcium (1.250 Sp. Gr.)	2.29	2.33
Absorbed / Gelled Electrolyte * (sealed lead-acid type)		2.25	*
Nickel-Cadmium (Ni-Cd)		1.42	1.47

^{*} Sealed lead-acid battery types should not be used in ambient temperatures above 95° F / 35° C, and should not normally be equalized. Consult your battery manufacturer's documentation for specific equalizing recommendations.

TEMPERATURE COMPENSATION

If your batteries are to see temperature variations during charging, a temperature compensation option (**EJ5033-0#**) is recommended. If this option is not part of your AT10.1, manual adjustments should be made. Refer to the equation and table below for temperature-adjusted voltages.

temperature-adjusted voltage = charge voltage x K

Temperature	Temperature	K	K
(°F)	(°C)	(Lead-Acid)	(Nickel-Cadmium)
35	1.7	1.058	1.044
45	7.2	1.044	1.034
55	12.8	1.031	1.023
65	18.3	1.017	1.013
75	23.9	1.003	1.002
77	25.0	1.000	1.000
85	29.4	0.989	0.992
95	35.0	0.975	0.981
105	40.6	0.961	0.970

COMMUNICATIONS MODULE

ONLINE SUPPLEMENTS

Operating Instructions Field Installation http://www.ATSeries.net/PDFs/JA0102-04.pdf http://www.ATSeries.net/PDFs/JD5008-00.pdf

INTRODUCTION

Your AT10.1 Microprocessor-controlled Float Battery Charger features provisions for an optional Communications Module which allows user's to remotely monitor and control the charger over a serial connection. This option supports **DNP3 Level 2** and **Modbus** protocols over **RS-232** or **RS-485** half-duplex. With this option installed, industry-standard **SCADA** (Supervisory Control And Data Acquisition) systems will be able to control, monitor, and log the events of the AT10.1. Using the Communications Module option, all features of the AT10.1 front instrument panel are accessible remotely.

Installed within an AT10.1, the AT Series Communications Module (option p/n **EJ5037-0#**), includes a Communications PC Board (A12) and a dc power supply resistor (R29). A special AT Series Communications Module *Operating Instructions* (<u>JA0102-04</u>) and field *Field Installation Instructions* (<u>JD5008-00</u>), are also provided for user support. A field retrofit kit (p/n **EJ5037-1#**) for the AT Series Communications Module is also available for installed AT10.1 units already in use.

An Ethernet Gateway accessory for AT Series Communication is available for either Modbus or DNP Level 2. Also available is a fiber optic modem kit, or an industry-standard 56Kbps V.92 modem with interconnection cable. Contact your sales representative to place an order for the AT Series Communication Module and/or accessories. Refer to the table below for ordering information.

Description	Part No.
Installed Communications Option for 12 Vdc AT10.1	EJ5037-01
Installed Communications Option for 24 Vdc AT10.1	EJ5037-02
Installed Communications Option for 48 Vdc AT10.1	EJ5037-03
Installed Communications Option for 130 Vdc AT10.1	EJ5037-04
Installed Communications Option for AT10-130-006	EJ5037-05
Communications Module Field Kit for 12 Vdc AT10.1	EJ5037-11
Communications Module Field Kit for 24 Vdc AT10.1	EJ5037-12
Communications Module Field Kit for 48 Vdc AT10.1	EJ5037-13
Communications Module Field Kit for 130 Vdc AT10.1	EJ5037-14
Communications Module Field Kit for AT10-130-006	EJ5037-15
Ethernet Gateway Interface for MODBUS AT Comm	EJ5226-0#
Ethernet Gateway Interface for DNP AT Comm	EJ5226-1#
Fiber Optic Modem w/Interface for AT Comm	EJ5230-0#
Industry Standard Modem w/10ft Cable	EJ5084-00
Industry Standard Modem w/25ft Cable	EJ5084-01
Industry Standard Modem w/50ft Cable	EJ5084-02

FORCED LOAD SHARING

ONLINE SUPPLEMENT

http://www.ATSeries.net/PDFs/JA5054-00.pdf

INTRODUCTION

Multiple battery chargers are sometimes employed in dc power systems to provide redundancy. Two or more chargers of the same voltage rating can be connected in parallel, each of them capable of powering the connected dc load and charging the battery. If a battery charger should fail during normal operation, the parallel charger can continue to supply the entire required dc load current, and maintain charge on the battery.

When two (2) AT10.1s operate in parallel, they normally will not share the load current equally. Since any two chargers will have slightly different characteristics, one of the two chargers in a system will have a slightly higher dc output voltage, and will therefore assume more of the burden of providing necessary load current. This section describes an optional accessory for the AT10.1 which *forces* units to share dc load equally. The accessory (ordering p/n EJ5126-##) consists of an interconnecting cable to provide such communication, and operating instructions.

SYSTEM REQUIREMENTS

- The forced load sharing feature is designed only to work with two (2) AT10.1 Series battery chargers. You cannot force load sharing with three (3) or more AT10.1s.
- Both AT10.1s must have the same dc voltage & current rating, and have the same dc filtering.
- Both AT10.1s must have the same ac input source and the same phase rotation.
- Both AT10.1s must feature **Rev. 6** (or higher) builds of the Main Control PC Boards (A1), and corresponding (Rev. 6 or higher) software programs.
- Both AT10.1s must use the same the same program version, since the forced load sharing option
 has not been tested using different program versions in each unit. To view the program version,
 press the LAMP TEST button on the front instrument panel of the AT10.1. When you release
 the button, the front panel meter displays the version number for two (2) seconds.
- The interconnecting signal cable length should be no more than 50ft (15m).

INSTALLING THE INTERCONNECTION CABLE

The AT Series forced load sharing accessory is normally supplied by the factory with a standard 15ft (4.6m) interconnection cable. A 25ft (7.6m) long cable and a 50ft (15.2m) long cable are also available. The interconnection cable is terminated at each end with a 6-pin connector that mates with the plastic connector (J4) on lower-right corner of the Main Control PC Board (A1). One end of the cable features an extra jumper in the connector, and should be identified for use with the **Secondary** charger. The other end of the cable connects to the **Primary** charger. Either AT10.1 may be selected as Primary or Secondary, but you may wish to choose the unit that is more accessible to be the Primary. The Primary charger controls the dc output voltage of both AT10.1s.

You may run the interconnection cable through conduit if necessary. However, do not run the cable through the same conduit with power wiring. Do not remove the connectors in order to "fish" the cable through the conduit. Maximum pulling tension is 46 lb. (20.9kg). The cable has a plenum-rated outer jacket, and passes the NFPA 262 flame propagation test. Install the cable between the AT10.1s, and anchor it in place at both ends before connecting. Connect each end to the Main Control PC Boards (A1), inserting the connector into J4 until it is completely seated.

NOTICE

Power cabling for the battery charger, battery, and dc load interconnection is **not** supplied with the AT10.1 or the AT Series Forced Load sharing option. All user-supplied system wiring should meet National Electric Code (NEC) standards, as well as local/site codes. Confirm polarity of all dc cabling before making connections.

OPERATING THE AT10.1 WITH FORCED LOAD SHARING

Restore external power connections to both AT10.1s, and restart according to the normal procedure in the AT10.1 Operating and Service Instructions. After the AT10.1s restart, the Primary charger attempts to establish communication with the Secondary. If communication is successful, the AT10.1s behave as follows:

- The Primary charger displays the message **LS-P** (Load Share, Primary) on the front panel meter, alternating with the normal display of output voltage and current.
- The Secondary charger displays the message **LS-S** (Load Share, Secondary) on the front panel meter, alternating with the normal display of output voltage and current.
- The Primary charger controls all voltage settings for both AT10.1s. You may adjust any voltage (float, equalize, alarm settings, etc.) at the front panel of the Primary charger. The front panel of the Secondary charger will not allow any settings to be changed.
- If one AT10.1 loses ac power (or is turned off), the remaining charger returns to independent operation, whether it was originally the Primary or Secondary. For this reason, it is important to set up both AT10.1s initially for the same operating voltages. If an alarm condition occurs, both AT10.1s revert to independent operation for the duration of the alarm.
- In the event of a fault in the interconnection, or any other problem with communication, the AT10.1s return to independent operation, and the front panel on each charger displays the message **E 14**, indicating the fault.
- There is a delay of up to four (4) seconds for the two (2) AT10.1s to establish forced load sharing communication. If communication is broken (or power is lost for one charger), there is up to a four (4) second delay for the other charger to resume independent operation.
- If you need to interchange the Primary and Secondary chargers, simply reverse the interconnection cable.
- The presence of the interconnection cable (and a proper interconnection) forces the two (2) AT10.1s into load sharing. Controlling load sharing from the front panel is neither necessary nor possible.

WHEN TEMPERATURE COMPENSATION IS INSTALLED

The AT Series forced load sharing feature is compatible with the AT Series external temperature compensation accessory. Both AT10.1s must have a temperature probe installed, and the probes should be located as close as possible to each other. When AT10.1s are load sharing, the primary charger will determine the temperature-compensated voltage, and adjust the output accordingly. The voltage displayed by the master and secondary may be different, if either temperature probe is defective or not installed. A slight difference in the displayed voltages may also occur if the two probes are not located in close proximity of each other. See user *Application Note* (JD5003-00) for further details regarding temperature compensation.

TROUBLE SHOOTING

If the AT Series Forced Load Sharing option is installed, but the output currents of the AT10.1s are unequal, refer to the following table.

PROBABLE CAUSE	RECOMMENDED ACTION	
Connection cable missing or installed incorrectly.	1. Ensure that the interconnection signal cable assembly is properly installed, and that the connector for the Secondary charger has the jumper as described at the top of page 3.	
Incorrect connections to ac power sources.	2. Ensure that both AT10.1s are connected to the same ac supply and that source phase rotation is the same for both chargers.	
3. Defective or improper Main Control PCB (A1)	3. Replace the Main Control PC Board (A1) in one charger at a time, noting system requirements, to restore correct load sharing operation.	

CE COMPLIANCE - PROPER GROUNDING

- It is the responsibility of the *installer* of the AT10.1 to supply suitable grounding and ground wire.
- The AT10.1 chassis must be grounded in accordance with the national electrical rules of the country where installed.
- The ground wire must be approved for use in the country in which the AT10.1 is installed, or bear the ◀ HAR ▶ mark.
- A separate bi-color ground wire (green with a 30% yellow stripe) must be run in hard-pipe conduit along with ac supply wiring.
- There must be no switches, splices, or over-current protection in the ground wire.
- Refer to the Data Nameplate Decal affixed to the outside panel of the AT10.1 to determine maximum available operating current.

UL DATA

A CAUTION

To operate this battery charger from inputs other than 120 Vac, you must use branch circuit protection. To reduce the risk of fire, use only on circuits provided with the following branch circuit protection in accordance with the National Electrical Code, ANSI/NFPA 70.

Current Rating	Voltage Rating			
	48 Vdc	130 Vdc	48 Vdc	130 Vdc
12 Adc		25A		20A
16 Adc	15A	25A	12A	20A
20 Adc	20A	30A	15A	30A
25 Adc	25A	40A	20A	35A
	208 Vac Branch Circuit Protection (Amperes)			Branch Circuit on (Amperes)

This table does not apply to units with 480 Vac input.

MANUAL SPECIFICATIONS

DOCUMENT NUMBER

The text and graphics contained within this manual are controlled by the battery charger manufacturer's internal part number (**JA5023-00**). The revision level and dates of this manual's text and graphics are listed below. These controls supercede all other available dates. The first two and last two pages of this manual are reserved for company-specific front and back cover artwork. Any revision levels, revision dates, or document numbers featured on the first two and last two pages of this manual refer to the cover artwork only.

DOCUMENT INFORMATION

Document Number: JA5023-00
Revision Level: 10H
Engineering Change Number: 22499

Electronic Filename: [JA5023-00.Rev10H.doc]
Last Date Saved: [9/25/2012 12:05 PM]
Last Date Printed: [9/25/2012 12:10 PM]

PARTS DATA PACKAGE

Any job-specific customized Parts Data Package report supplied with this battery charger and/or this manual supercedes the information featured in the standard parts list starting on page 64. The data featured in that particular document is applicable only to the battery charger featuring the same serial number listed on the Parts Data Package report.

DRAWINGS

A customized record drawing package is available for your AT10.1, featuring a unit-specific drawing list / data nameplate detail, outline drawing, itemized internal component layout, electrical schematic with component ratings, and a full connection diagram. If the standard drawings featured in this manual are not sufficient, please contact your Sales Representative for drawing availability from the battery charger manufacturer.

Any job-specific custom drawings supplied with your AT10.1 and/or this manual, supercede the standard drawings featured in Appendix C. The standard drawings and corresponding page numbers featured in this section may not be included with custom printed manuals, when job-specific custom drawings are supplied.

ONLINE AVAILABILITY



An unlabeled version of this operating and service instruction manual is available online at http://www.ATSeries.net/PDFs/JA0102-01.pdf. Other related product operating manuals, feature and accessory special instructions, standard drawings (including the ones listed in this manual), field service instructions, and product application notes for the AT Series microprocessor-controlled battery chargers and battery charger products are available online at http://www.ATSeries.net/. Saved in Adobe Acrobat Portable Document Format (PDF), they are readily available for downloading and printing.

If revision levels differ between the drawings embedded in this manual and the full online PDF drawings, refer to document with the higher revision level. For document availability of private-labeled manuals and/or standard drawings, please contact your sales representative or visit the web site listed on the **back cover** of this manual.

MANUAL SPECIFICATIONS

RELATED DOCUMENTS

Doc. No.	Online Hyperlink	Description	
JA0102-01	http://www.ATSeries.net/PDFs/JA0102-01.pdf	AT10.1 G1 Manual (unlabeled)	
JA0102-02	http://www.ATSeries.net/PDFs/JA0102-02.pdf	AT10.1 G2 Manual (unlabeled)	
JA0102-03	http://www.ATSeries.net/PDFs/JA0102-03.pdf	AT30 Manual (unlabeled)	
JA0102-04	http://www.ATSeries.net/PDFs/JA0102-04.pdf	AT Comm. Module Manual (unlabeled)	
JA0102-05	http://www.ATSeries.net/PDFs/JA0102-05.pdf	AT-DC Dist Panel Manual (unlabeled)	
JA5015-00	http://www.ATSeries.net/PDFs/JA5015-00.pdf	AT TempCo Probe Acsy. Instructions	
JA5054-00	http://www.ATSeries.net/PDFs/JA5054-00.pdf	AT Forced Load Sharing Instructions	
JA5098-00	http://www.ATSeries.net/PDFs/JA5098-00.pdf	AT Latching Alarm Relays Instructions	
JC5020-00	http://www.ATSeries.net/PDFs/JC5020-00.pdf	AT Series Charger Quick Setup Sheet	
E IEOOO VV	http://www.ATCorios.not/DDEs/E IE000 VV ndf	AT Corios Cround Datastian Valturator	
EJ5088-XX	http://www.ATSeries.net/PDFs/EJ5088-XX.pdf http://www.ATSeries.net/PDFs/EJ5130-XX.pdf	AT Series Borrier Type Alerm Terminals	
EJ5130-XX	-	AT Series Barrier Type Alarm Terminals	
EJ5136-XX	http://www.ATSeries.net/PDFs/EJ5136-XX.pdf	AT Series Battery Discharge Alarm	
EJ5137-XX	http://www.ATSeries.net/PDFs/EJ5137-XX.pdf	AT Series End Of Discharge Alarm	
JA0083-00	http://www.ATSeries.net/PDFs/JA0083-00.pdf	AT10.1 Floor-Mtg. Instructions	
JA0003-00	http://www.ATSeries.net/PDFs/JA0091-00.pdf	AT10.1 St-586/594 Rack-Mtg. Instructions	
JA0091-00	http://www.ATSeries.net/PDFs/JA0092-00.pdf	AT10.1 St-586/594 NEMA-2 Drip Shield	
JA0107-00	http://www.ATSeries.net/PDFs/JA0107-00.pdf	AT10.1 St-586/594 Cabinet Heater Acsy.	
JA0108-00	http://www.ATSeries.net/PDFs/JA0108-00.pdf	•	
0710100 00	intp://www.xtroches.netrobrasiasiasiasiasiasiasiasiasiasiasiasiasia	71110.11 of oboroos addiner 1 dalook rooy.	
JD0064-00	http://www.ATSeries.net/PDFs/JD0064-00.pdf	Preventative Maintenance Procedure	
JD0064-01	http://www.ATSeries.net/PDFs/JD0064-01.pdf	AT Series Charger Start-up Procedure	
JD5003-00	http://www.ATSeries.net/PDFs/JD5003-00.pdf	TempCo Probe Application Note	
JD5008-00	http://www.ATSeries.net/PDFs/JD5008-00.pdf	AT Comm. Module Field Installation	
JD5009-00	http://www.ATSeries.net/PDFs/JD5009-00.pdf	AT10.1 G1 Rectifier Field Installation	
JD5010-00	http://www.ATSeries.net/PDFs/JD5010-00.pdf	AT Power Res. (R3) Field Installation	
JD5011-00	http://www.ATSeries.net/PDFs/JD5011-00.pdf	Ext. Free-Wheeling Diode Application Note	
JD5012-00	http://www.ATSeries.net/PDFs/JD5012-00.pdf	Main Ctrl PC Board (A1) Field Installation	
JD5014-00	http://www.ATSeries.net/PDFs/JD5014-00.pdf	AT10.1 St-586/594 Encl. Keylock Acsy.	
JD5025-00	http://www.ATSeries.net/PDFs/JD5025-00.pdf	AT10.1 G1 Aux Alarm Relay Field Install	
DC5016-00	http://www.ATSeries.net/PDFs/DC5016-00.pdf	AT Series AC Input Current Tables	
JD0052-00	http://www.ATSeries.net/PDFs/JD0052-00.pdf	Battery Discharge Dual Operation Note	
JD5002-00	http://www.ATSeries.net/PDFs/JD5002-00.pdf	DC Motor Starting Application Note	
JD5006-00	http://www.ATSeries.net/PDFs/JD5006-00.pdf	Alt. & Temp. De-Rating Application Note	
JD5013-00	http://www.ATSeries.net/PDFs/JD5013-00.pdf	AC Ripple Specification Application Note	
JD5032-00	http://www.ATSeries.net/PDFs/JD5032-00.pdf	Ground Fault Detection Application Note	
JF5039-00	http://www.ATSeries.net/PDFs/JF5039-00.pdf	AT10.1/AT30 3rd Party Agency Approvals	
JF5045-00	http://www.ATSeries.net/PDFs/JF5045-00.pdf	Proper Sizing of Industrial Battery Chargers	



For unpacking and installation instructions, see section 1 on page 2 in this manual

To learn how to use the equalize timers, see sections 2.2.4 on page 27 and 2.3.3 on page 32

Setting

Startup

► Turn on the dc breaker, labeled "DC OUTPUT".

► Turn on the ac breaker, labeled "AC INPUT".

Changing between Float and Equalize Modes

► Press the GRAD key to toggle from Float mode to Equalize mode. Press again to toggle back to Float.

The green or yellow indicator identifies the current mode.

For details on setting parameters, see section 2.3 starting on page 30

Etting Float Voltage
Equalize Voltage
Equalize Timer
High DC Voltage
Low DC Voltage
Current Limit

If you don't press any key for 25 seconds, the AT10.1

resumes normal operation automatically

► Press the key. The **DC VOLTS** and **FLOAT** indicators light, and the digital display flashes the present float voltage setting.

- ► Press the or key until the digital display indicates the desired float voltage.
- ▶ Press the key to save the new setting internally.
- ► The **EDIT** sequence advances to the equalize voltage as shown by the front panel indicators. Repeat the above steps until you have set all parameters.



